



CRANFIELD UNIVERSITY

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**SMALL- TO MEDIUM- SIZED MANUFACTURERS (SMMs) IN
SUPPLY CHAINS: DEVELOPMENT OF EFFECTIVE CUSTOMER
RELATIONSHIPS AND GROWTH**

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**Small- to Medium- sized Manufacturers in supply chains: Development of Effective
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ABSTRACT

This thesis details a study into the role of Small- to Medium- sized Manufacturers (SMMs) in supply chains and how this may affect SMMs' growth potential. The study draws upon a variety of research streams including Supply Chain Management, Industrial Marketing, and the literature on factors that affect firm growth. The objectives of the study are to:

- identify relationship management activities employed by SMMs and
- investigate the links between relationship management activities, critical dimensions of customer relationships and growth potential

To this end, a series of semi-structured interviews with a set of SMMs and a large-scale mail survey of SMMs are conducted. Data collected through the mail survey are analysed using a variety of statistical techniques including factor analysis, multiple regression analysis and cluster analysis. Study findings indicate that SMMs who are problem-solvers and increase their own share of value added in the supply chain can develop stronger customer relationships. SMMs can influence the strength of customer relationships to a greater extent than the fairness of customer relationships. The study proposes a relationship-oriented typology of SMMs based on how they define their business and how they shape their customer base. The growth comparison among SMM types suggests that SMMs who develop a balanced portfolio of customer relationships – by developing good working relationships while avoiding excessive dependence on any customer – realise higher growth potential.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

This study is concerned with the investigation of the role of Small- to Medium- sized Manufacturers (SMMs) in supply chains and how this may affect their growth potential. This introductory chapter sets the background for the study, discusses factors that render the research area important, and states the objectives of the study. The structure of the thesis is detailed.

1.2 Rationale and building blocks of the research

The Small- to Medium- sized Enterprise (SME) sector represents an important part of any national economy [see, for example, Storey 1994, Voss et al. 1998, Chaston 1998]. In Europe, as well as the US, high growth SMEs in the service and manufacturing sectors are important sources of employment generation [Flynn 1998, Birch 1991].

Various studies have suggested that growth SMEs represent a minority of the whole SME population [for example, ESRC Centre for Business Research 1996, Storey and Morgan 1998]. Studies have shown that not all SMEs have growth as their objective [Turok 1991]. Theories of growth have not managed to give decisive answers as to why firms grow [Geroski, 1999]. Factors that affect the growth of SMEs constitute therefore an important research area for academics and policy makers [Chaston 1998].

This research was funded by the Engineering and Marine Training Authority (EMTA) in the UK. EMTA's mission is to promote the competitiveness of the UK engineering manufacturing industry. Studies focusing specifically on manufacturing firms within the SME sector are rare [Wijewardena and Tibbits 1999]. The research therefore

focuses on manufacturing firms within the SME sector that is, on Small- to Medium-sized Manufacturers (SMMs).

Increasingly, the Operations Management and Marketing disciplines are shifting their focus from the study of individual firms to the study of linkages and interdependencies between firms in supply chains and networks. Management of the linkages between organisations, as well as those between organisations and their suppliers and customers, is increasingly seen as a source of competitive advantage by industrialists and academics.

The study therefore looks at the SMMs as members of the supply chains in which they operate. It investigates their role in supply chains and seeks to uncover links between SMMs' behaviour in supply chains and their growth potential.

1.3 Research objectives and methodology

In investigating the role of SMMs in supply chains, this study focuses particularly on their relationships with customers. Many researchers have pointed out that research in supply chains is biased towards the strategies and policies of the large companies as customers [Bates and Slack 1998, New 1996, Schrunder and Mudambi 1995]. However, the industrial marketing literature has long recognised that both the customer and the supplier are active in industrial relationships [IMP Group 1982].

Management processes employed by SMMs are increasingly becoming the focus of research [Chaston 1998]. Customer focus, personal attention to customer needs are frequently perceived to be characteristics or strengths of SMMs [ESRC Centre for Business Research 1996, Storey and Morgan 1998]. How these may materialise in the form of specific management activities, however, is much less explicit. This constitutes an important gap in knowledge about SMMs' behaviour, particularly since practices employed by large firms are not necessarily transferable to an SMM context.

This study therefore considers the SMM as an active part in the relationship and seeks to answer the following research questions with reference to the SMMs' customers:

1. What are the relationship management activities employed by SMMs?
2. How do these relationship management activities affect critical dimensions of customer relationships within a transactional environment defined by the peculiarities of the SMM sector?
3. How do critical dimensions of customer relationships affect the growth potential of SMMs?

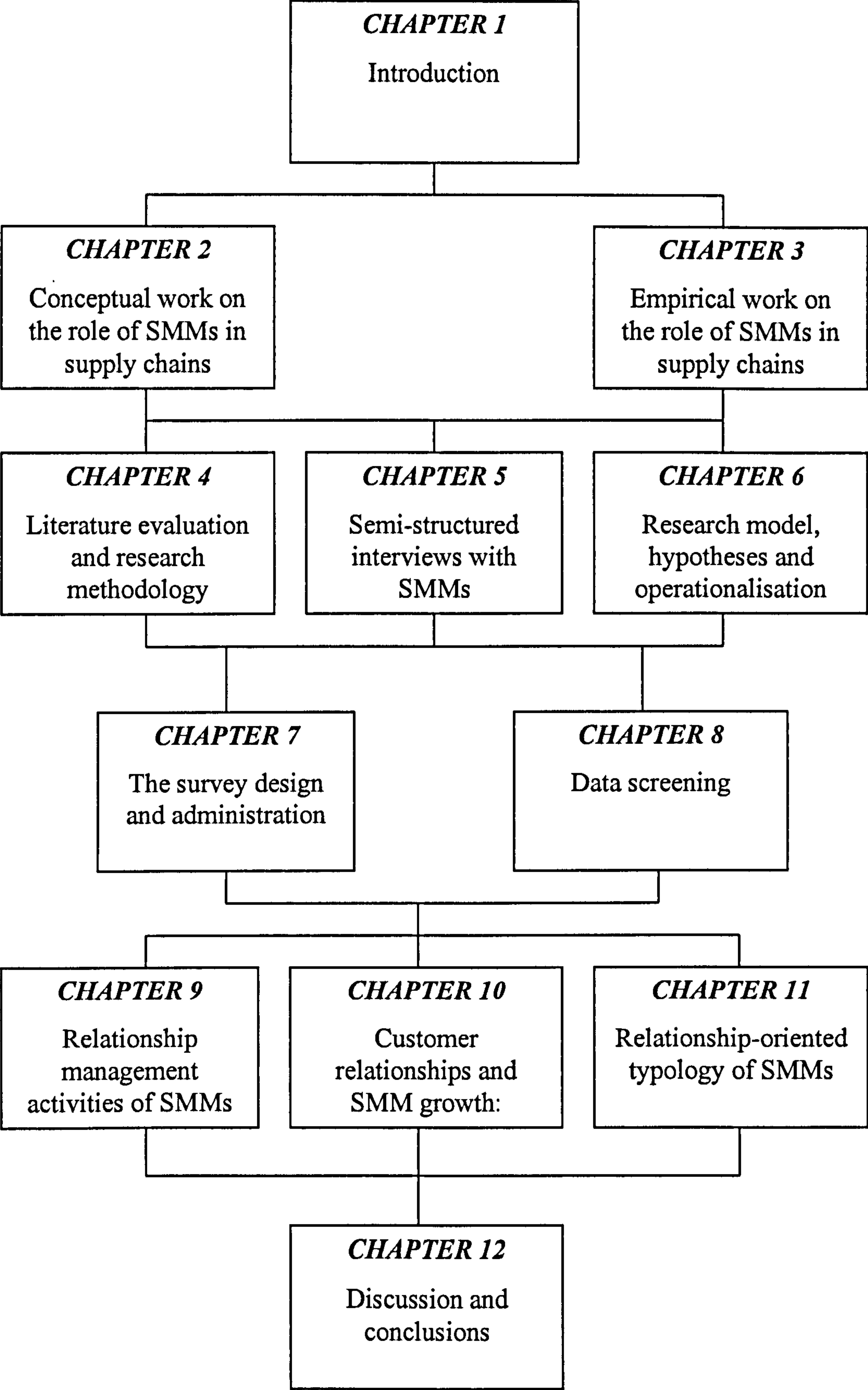
Given the nature of the research questions, the unit of analysis is one-to-many, that is, the relationships of the focal SMM with its customers.

The study adopted a mixed research methodology. A broad, multidisciplinary literature review and a series of semi-structured interviews with SMMs were used to model the role of SMMs in supply chains with reference to their customer relationships, develop testable research hypotheses and design a questionnaire for data collection. Data collected from a mail survey of the UK engineering manufacturing industry was used to test these hypotheses. Data analysis was performed using factor analysis, multiple regression analysis and cluster analysis: factor analysis was used to identify the relationship management activities employed by SMMs and multiple regression analysis was used to examine links between relationship management activities, customer relationships and growth. Finally, cluster analysis was used to uncover naturally occurring types of SMMs with regard to their customer relationships.

1.4 Structure of the thesis

Exhibit 1.1 provides an overview of the thesis structure. The literature review is organised into two Chapters: Chapter 2 reviews the supply chain management and industrial marketing literatures, as well as literature on factors affecting firm growth,

Exhibit 1.1 The thesis structure



to lay out the background for examining the role of SMMs in supply chains. Chapter 3 reviews empirical studies dealing with the nature of supply chain relationships and their determinants as well as firm performance within these relationships. This review encompasses studies that do not deal exclusively with the SMM sector.

Chapter 4 is an evaluation of conceptual and empirical work in order to develop a conceptual model of the role of SMMs in supply chains with reference to their customer relationships, and to identify gaps in current knowledge that this study will attempt to address. It also discusses the research methodology deemed appropriate given the state of current knowledge and the nature of research questions to be answered.

Chapter 5 discusses findings from a series of semi-structured interviews with a set of SMMs aimed at establishing a firm correspondence between industrial practice and the study (including research questions and concept operationalisation).

Chapter 6 brings together findings from the literature review and the semi-structured interviews with SMMs to develop a set of testable research hypotheses.

Chapter 7 discusses the design and administration of the mail survey that was conducted to collect data from UK engineering manufacturing industry SMMs.

Chapter 8 describes a set of preliminary checks on the data collected in order to ensure validity of the main data analysis.

Chapter 9 presents a factor analysis on the activities of SMMs in order to identify relationship management activities employed by SMMs with reference to their customer relationships, and to produce a new set of variables. It also produces a new set of variables, much smaller in number, that incorporates the nature of the original variables, for use in subsequent stages of the analysis.

Chapter 10 shows a series of multiple regression analyses performed to examine links between relationship management activities, critical dimensions of customer relationships, and SMM growth.

Chapter 11 presents results of cluster analysis with the aim of combining significant findings from previous stages of analyses into a relationship-oriented typology of SMMs which portrays naturally occurring types of SMMs and compares them in terms of their growth potential.

Chapter 12 is a synthesis of research findings to develop the study's conclusions. Specific contributions to theory development and industrial practice are discussed and potential avenues for further research are suggested.

1.5 Summary

Examination of the growth potential of SMMs as active members of the supply chains in which they operate is an area largely underresearched. Yet, implications for theory development, industrial practice and policy-making are very important. This study aims to contribute towards filling gaps in knowledge in this area. Chapter 2 lays out the theoretical background for this work.

CHAPTER 2

THEORETICAL BASIS FOR THE ROLE OF SMMs IN SUPPLY CHAINS

2.1 Introduction

Recent emphasis on Supply Chain Management as a new paradigm of competition calls for an examination of the role of Small- to Medium-sized Manufacturers (SMMs) in supply chains. This chapter reviews the literature from Industrial Marketing and Supply Chain Management in order to assess theoretical work that can potentially shed light onto the role of SMMs as active members of the supply chains in which they operate.

2.2 Nature of research on the role of SMMs in supply chains

The Small- to Medium- sized Enterprise (SME) sector represents an important part of any national economy [Storey 1994, Voss et al. 1998, Chaston 1998]. In Europe, at a time when industrial giants continue to slash jobs, high growth SMEs in the service and manufacturing sectors are creating thousands of jobs [Flynn 1998].

Various studies have suggested that growth SMEs represent a minority of the whole SME population [for example, ESRC Centre for Business Research 1996, Storey and Morgan 1998]. Factors that affect the growth of SMEs constitute therefore an important research area for academics and policy makers [Chaston 1998]. Studies focusing specifically on manufacturing firms within the SME sector are rare [Wijewardena and Tibbits 1999]. This study focuses on manufacturing firms and uses the term Small- to Medium- sized Manufacturers (SMMs) to describe this particular section of the SME population.

Research on factors that affect SME growth has mainly focused on the areas of entrepreneurial personality, organisation development, functional management skills,

and sectoral economics [Chaston 1998, Wijewardena and Tibbits 1999]. In recent years, new paradigms of competition have been proposed. Emphasis on Supply Chain Management has led to an increasing recognition of the interdependencies that exist between firms in supply chains. The linkages between organisations and their suppliers, customers and distributors are increasingly viewed as being critical to commercial success, and are becoming the focus of research in the Operations Management and Marketing disciplines [New and Mitropoulos 1995]. According to Chaston [1998] a new school of thought has emerged which, under the collective notion of *Relationship Marketing*, focuses on the internal processes in an organisation that may lead to building strong customer loyalty.

The Supply Chain literature has been largely biased towards the policies that large companies do, or should follow for developing their supply base [New 1996, Bates and Slack 1998]. Consequently, greater emphasis has been given to issues such as supplier selection, supplier development, JIT supply, etc., [see for example Choi and Hartley 1996, Hartley and Choi 1996, Fisher 1997, Forza 1996], rather than on supplier strategies to cope with demands placed on them by these developments. The Marketing literature on the other hand has focused on marketing channel relationships. The perspective of the SMM -- who is usually an upstream player -- is largely underdeveloped [Schrunder and Mudambi 1995, Bates and Slack 1998]. As long as the Supply Chain literature is focused on large manufacturing firms and on a single industry (automotive), there are few prospects for the development of broadly applicable theories [New 1996, Bates and Slack 1998].

It is not only research that is biased towards the perspective of the large firm as a customer. Under the “Managing into the ‘90s Programme”, the UK Department of Trade and Industry published a series of booklets related to the area of Supply Chain Management with the following titles:

- “Logistics and Supply Chain Management: A Management Overview”
- “Purchasing: A Competitive Business. A Strategic Overview”

- “Getting the Most from Your Suppliers: A Management Overview”
- “Managing your Purchasing Operation: A Management Overview”
- “Better Value for Money from Purchasing: A Management Overview”.

The series contains a number of very interesting “best practice” cases; however, these refer predominantly to large companies [for an overview see New, 1996].

In conclusion, the study of factors that affect SMM growth has not taken into account the emergence of new paradigms of competition and in particular the emphasis on Supply Chain Management. The Supply Chain literature on the other hand, has largely adopted the perspective of the large firm as a customer. This constitutes a gap into our understanding of the role of SMMs in supply chains.

2.3 Business definition and the role of SMMs in supply chains

The way a company defines its business is essential in setting objectives and formulating appropriate strategies [Abell, 1980]. Increasing recognition of interdependencies among firms in supply chains makes it imperative for any business definition to describe the role of the company as part of supply chains and to provide a tool to describe how this role changes over time. Ansoff [1965, p.127] defined strategic change as “*A realignment of the firm’s product/market environment.*” Abell [1980] suggested that changes in business definition are typically conceptualised in these two conventional dimensions. He, however, argued that business definition along these two dimensions is inadequate: Abell proposed a business definition across three dimensions -- customer groups, customer functions, and technologies. Decomposition of the general term “market” into customer groups and customer functions is particularly suitable as a basis for examining the role of SMMs in supply chains. According to Abell [1980], products or services perform certain functions for the customer; functions are separated conceptually from the way the function is performed (“technology”) and the attributes or benefits that a customer may perceive

as important criteria for choice. In a supply chain context, functions are directly linked with the SMM's own share of added value in the supply chain.

Supply Chain Management focuses on linkages between firms rather than individual firms. In this respect, a business definition that relates the SMM to its customers based on the function it performs for them, is a constructive basis for understanding the SMM's role in the supply chain.

2.4 The importance of customer relationships in industrial markets

The bias in research and policy making that was identified in the previous sections is a major shortcoming, given the importance of customers in industrial markets. According to Kotler [1994, p.132]

“Industrial markets consist of organisations that buy goods and services needed for producing other products and services for the purpose of making profits and/or achieving other objectives”.

The Industrial Marketing literature suggests a number of factors that make each individual customer important in industrial markets:

Sales concentration

Many industrial markets consist of a small number of customers who are responsible for an important share of the selling company's business [Shapiro 1991, Fiocca 1982, Campbell and Cunningham 1983]. This has direct implications for the balance of power in the market in favour of customers [Fiocca 1982]. Moreover, each customer often has special and unique needs and behaviours that require the seller to manage each customer individually [Fiocca 1982].

Buying process complexity

The “customer” is a complex set of interacting organisations and people with varying degrees of influence over the purchasing process, and potentially different and sometimes conflicting objectives (for example, the purchasing department may be more price sensitive than the engineering department that may focus more on quality and functionality issues) [Shapiro et al. 1987, Bonoma 1982, Shapiro and Bonoma 1983, Fiocca 1982].

Supplier/customer relationships

All customer and supplier firms that do business together have some sort of working relationship [Anderson and Narus 1991]. The researchers of the IMP group have long suggested [IMP Group 1982] that industrial markets are characterised by a relative stability and inertia in terms of supplier/customer relationships. Moreover, they have provided evidence that some form of adaptation in systems and procedures is inevitable in the course of these relationships. For the supplier, breaking into existing relationships can be difficult. The costs associated with acquiring new customers can be much higher than the costs associated with keeping existing customers. Webster [1994] refers to studies which suggest that to acquire a new customer requires spending about five times more than is needed to keep an old customer’s loyalty. Creating and maintaining a base of loyal customers appears to be of utmost importance for suppliers [Fiocca, 1982]. *Relationship Marketing* advocates departure from transactions towards long lasting customer relationships as the vehicle for organisations to achieve survival and growth in highly competitive, rapidly changing markets [Chaston 1998].

Derived demand.

Demand for the industrial seller’s product is dependent upon demand for its customer’s product. As a result, industrial sellers must always be up-to-date about current and prospective trends in their customers’ business [Fiocca 1982].

In industrial markets, the importance of individual customers renders the management of customer relationships a critical factor to the firm's success.

2.5 Customer retention and expansion

Webster [1994] argued that customer loyalty and repeat purchases are the main drivers of profitability for most businesses: it costs much less to serve an existing customer than to create a new one. Studies suggest that to acquire a new customer requires spending about five times more than is needed to keep an old customer's loyalty [Webster 1994, Cespedes 1995, Heskett et al. 1994]. Heskett et al. [1990] referred to studies in the service sector to point out that firms which offer expanded services to targeted markets have a higher probability of meeting or exceeding their expectations on new service success than those offering current services to newly developed markets. They will all, however, achieve a higher frequency of success than competitors who seek to grow through the simultaneous development of new services for new customers.

Dowling and Uncles [1997] adopted a rather different stance in their discussion of benefits from loyalty programs. The premise is that loyal customers have a number of attributes that make them attractive for business including lower costs to serve, lower price sensitivity, higher expenditure with the supplier company, and their contribution to the supplier's reputation building. Dowling and Uncles argue however that there is little well-documented empirical research to substantiate these claims. Factors other than loyalty, -- for example, type and size of order -- drive cost-to-serve. Perceived value rather than loyalty drive price sensitivity and greater expenditure with the supplier company.

Ceteris paribus, perceived value may diminish over time. Shapiro et al. [1987], for example, suggested that there is a general tendency of products to evolve from high margin specialties to low margin commodities. This tendency drives the shift of customers from attributing great value on the supplier's offering and thus being

willing to pay for the service, to becoming price sensitive and insensitive to quality and service, or even worse for the supplier, to demand the highest service for the lowest price. This is the type of customers that Shapiro et al. [1987] call aggressive.

Although conceptually different, customer loyalty may -- especially in the context of SMMs -- mean dependence on a few major customers [ESRC 1996]. This, in turn, may lead to strategic vulnerability [Webster 1994, Krapfel et al. 1991].

Therefore, it appears that there is a need for the SMM to manage customer relationships with the dual purpose of customer retention and customer base expansion. Krapfel et al. [1991] have suggested that firms may find it desirable to develop a balanced portfolio of customer relationships by developing good working relationships with customers while at the same time avoiding excessive dependence on a few customers.

The inherent importance in industrial markets of individual customers and customer relationships creates the need to assess the level of knowledge in how SMMs should manage these relationships. In particular, adopting an SMM perspective to examine the role of SMMs in supply chains means that one should look for answers to the following questions:

1. What do customers expect from SMMs in their role as suppliers?
2. What are the problems that SMMs encounter in their dealings with customers?
3. How can SMMs manage their customer base?
4. What is the impact on SMM's performance of activities for managing their customer base?

In order to assess current knowledge that could potentially provide answers to the above questions, this literature review covers the following areas:

- Antecedents of inter-organisational relationships

- Nature of inter-organisational relationships
- Managing a portfolio of customer relationships
- Relationship management activities
- Customer-related factors that affect firm growth
- The effect of relationships and relationship management activities on supplier and dyadic performance

The review of the above areas sought to identify theoretical work that could shed light on the role of SMMs as active members of the supply chains in which they operate.

2.6 Antecedents of inter-organisational relationships

A variety of theoretical streams have attempted to identify and examine antecedents of various forms of relationships. Heide [1994] reviewed resource dependence theory, transaction cost theory, and relational contracting theory to conclude that, generally, close inter-organisational relationships are generally viewed as a response to uncertainty and dependence (including transaction specific investments). Uncertainty as a construct has been defined and operationalised in different ways in various studies [Noordewier et al. 1990, Heide and John 1990]. At a conceptual level, Achrol and Stern [1988] suggested a list of seven environmental dimensions. They do not provide, however, any guidance as to how these could be operationalised. In general, there has been an effort to analytically decompose uncertainty into two dimensions: environmental uncertainty which refers to the general environment that the firms in the relationship face, and the uncertainty which refers to the specific relationship in terms of the product/service exchanged and the characteristics of the firms involved in the relationship [Heide 1994, Hakansson et al. 1997, Heide and John 1990, Campbell 1985, Noordewier et al. 1990, Frazier et al. 1988, Bensaou and Venkatraman 1993].

Frazier et al. [1988] suggested that the OEM's (as a customer) interest in JIT relationships is expected to be influenced by the level of uncertainty, the firm's market position and aspiration, as well as product characteristics. Uncertainty may

arise from environmental factors such as the number and pattern of linkages among suppliers, OEMs, and customers; the power of competitors and other outside actors; the economic conditions; and the level of environmental change. They posit that under conditions of low uncertainty and low product importance, the customer is not likely to consider the development of JIT relationships.

Hakansson et al. [1997] distinguish between three forms of uncertainty from the buyer's point of view:

- *need uncertainty* defined as the difficulty in interpreting the exact nature of the needs for materials, machines, tools, services etc. in the firm; combined with the importance of the actual need, it defines the degree of uncertainty the buyer experiences
- *market uncertainty*, which refers to the heterogeneity of suppliers and how supplier characteristics change over time
- *transaction uncertainty*, which refers to issues pertaining to the specific relationship between the buyer and the seller; this uncertainty may have its source in the actual exchange, trading procedures, or differences in language, culture, technology, etc., that may be obstacles to the two parties' understanding of one another.

Hakansson et al. [1990] posited that different types of uncertainty may lead customers to adopt different relationship management strategies. High need uncertainty will lead buyers to place greater importance on functional and quality aspects rather than price, to exhibit high source loyalty, and to engage in more frequent and multifunctional contacts with suppliers. On the other hand, under conditions of high market uncertainty, buyers are more inclined to maintain contacts with a relatively greater number of suppliers. Finally, under conditions of high transaction uncertainty, buyers will more likely try to find parallel suppliers to ensure continuity of supply, and place greater emphasis on the supplier selection process. The authors present case studies of suppliers who systematically attempt to manage the different elements of customers'

perceived uncertainty in order to keep existing customers or to get the business of new customers.

Campbell [1985] identified three generic types of buying -- namely, competitive, cooperative and command -- and suggested that not only environmental, but also product, company and individual characteristics may influence the selection of a particular buying strategy. In Campbell's model, technological unpredictability appears to favour cooperative or command buying. Fragmentation of the supplier's industry, as well as intense price competition, appear to favour competitive buying. Specific industry norms and traditions are also expected to have an effect.

In terms of product characteristics, it appears that the higher the customer's uncertainty in specifying product performance, the higher the possibility for the choice of cooperative buying. Product customisation may lead to cooperative or command buying. Asymmetries in company size and, in particular, a size advantage on behalf of the buyer favour the selection of a competitive or command buying strategy. Willingness to seek a cooperative behaviour works in favour of the adoption of a cooperative strategy. Familiarity and respect of each other's technical knowledge increase the possibilities for adopting cooperative buying. Perceptions of high product importance may lead to any of the three strategies. Finally, personal relationships between people from the two organisations in contact do not necessarily favour a cooperative buying strategy, as they can also apply in a context of command strategy.

Johnston and Lewin [1996] reviewed conceptual and empirical work on organisational buying behaviour over the previous 25 years. Based on this accumulated knowledge they suggest, among other things, that as the risk associated with an organisational purchase increases:

- sellers who offer proven products and solutions will be favoured. Product quality and after-sales service will be the most important criteria whereas price, while always important, will be considered only after product and service criteria have been fully met

- a collaborative or problem-solving strategy is most likely to be used in negotiations between the buying and the selling firm. These negotiations will most likely focus on cooperation and information exchange in an attempt to discover the best solution to the purchase problem
- relationships and established networks of communication between multiple members of the buying and selling firms become increasingly important, since they facilitate information exchange and foster an atmosphere of cooperation, thus helping to reduce perceived purchase risk.

In conclusion, inter-organisational relationships are generally viewed as response to uncertainty and dependence. It is not at all clear, however, what form these relationships may take under various conditions of uncertainty and dependence.

2.7 Nature of inter-organisational relationships

A number of typologies of supplier-customer relationships have been proposed in the literature [e.g., Dwyer 1987, Frazier et al. 1988, Heide 1994, Christopher 1992, Cooper and Gardner 1993]. The common thread of these typologies is that they conceptualise supplier-customer relationships along a continuum ranging from adversarial, “arms’ length” relationships to fully co-operative or “partnership” relationships. The former are typically short-term, price-led, with minimum information exchange, whereas the latter are typically long-term, win/win and information intensive relationships. Heide [1994], however, suggested that, within a specific relationship, processes from different types of relationships might be combined in different ways. He further suggested that the use of general terms such as “partnerships” or “alliances” is potentially misleading since it obscures the nature of processes that take place in supplier-customer relationships. A critical parameter that should be taken into account in assessing the nature of supplier-customer relationships is the balance of power between the two parties.

Based on Emerson's [1962] work, power has been defined in the marketing channels literature as the influence, or potential influence, which one firm has over another firm's beliefs and behaviour relative to a set of decision variables [El-Ansary and Stern 1972, Frazier 1983]. Power can be thought of as the inverse of dependence. In other words, the level of power A has over B is inversely proportional to the level of dependence B has on A [Cronin et al. 1994]. Power/dependence is a central aspect of inter-organisational relationships. Anderson and Narus [1991] suggested that collaborative relations prosper as long as the supplier firm and the customer firm each have significant and roughly the same dependence upon the relationship. In this dependence situation, there is mutual interest in cooperating to find ways to add value or reduce cost and in equitably sharing these relationship benefits.

Asymmetric dependence leads to strategic vulnerability [Krapfel et al., Webster 1994, Anderson and Narus, 1991]. Dependence is a central dimension in the typologies of inter-organisational relationships proposed in the literature. In his typology of inter-organisational relationships, Heide [1994] made an explicit distinction between a unilateral/hierarchical form characterised by the ability of one exchange partner to impose decisions on the other, and a bilateral form in which the parties jointly develop policies directed toward the achievement of certain goals. Campbell [1985] also described departure from competitive buying as cooperative or command buying, the latter having its source in the buyer's ability to impose decisions on the seller.

Interorganisational relationships are complex, multidimensional phenomena. Furthermore, they do not develop in a sequential manner. This means that the use of general terms such as "partnerships" or "alliances" may obscure the true nature of processes that take place in given relationships.

2.8 The nature of the supplier offering and supplier selection criteria

The discussion of criteria on which buyers select a supplier has to take into account the nature of the supplier's offering. Levitt [1991b] suggested that products are almost always a combination of tangible and intangible attributes. Any offering that accompanies the tangible product is an attribute which may give the seller the ability to differentiate its total offering from the competition. According to Webster [1994] customers are buying value in the form of benefits provided by the product offering: the product *per se* may be relatively incidental to the total value provided. Customer expectations are often focused on the service bundle that accompanies the product offering, not the physical product itself.

Anderson and Narus [1995] provided a broad definition of supplementary services to include any programs that help customers to design their products or reduce their costs. Jackson [1985] emphasised the importance of a systems approach in keeping customers: by considering the seller's offering as a system comprising modular building blocks, system benefits are essentially the "added value" that a customer can obtain by buying the whole system from one vendor.

Cespedes [1995] pointed out that many companies adopt a narrow definition of customer service focusing on product delivery and repair and attitudes of employees in direct contact with customers. Customer service, however, encompasses many more elements that create value for the customer. Cespedes suggested that a definition of customer service should include product-related characteristics such as its price/performance characteristics and specifications that meet customer requirements, but also a wide range of pre-purchase and post-purchase activities that add value to the physical product. This means that a definition of customer service should include any vendor activities that may reduce the customer's information search costs and product in-use costs, such as assistance in applications development provided before the sale, and training or repair services provided after the sale.

Hakansson et al. [1990] emphasised the problem-solving dimension of the seller's offering in industrial markets. They distinguished between the seller's need-solving ability and transfer ability. Need-solving ability includes both the ability which is built into the product (function, quality, etc.) and the services which are given in combination with the product -- for example, the seller's ability to understand and interpret the buyer's need and find suitable solutions. Transfer ability concerns the degree to which the seller can transfer the solution to the buyer.

Bonoma and Shapiro [1983] discussed the nature of buying criteria and noted that these should be broken down into rational and nonrational criteria. Price, quality, and service from the supplier have been viewed as the primary rational industrial-buying motives, with availability of goods during periods of uncertain supply and reliability of the transaction flow important secondary motives. Bonoma and Shapiro noted that a number of investigators have challenged this view, and have argued that the nonrational or social aspects of industrial buying are equally important. The authors cited evidence from a study conducted by Webster showing that industrial buying is a joint function of the personal needs of the purchasers for recognition and advancement, and their social needs to satisfy those in the firm who will be the users of the purchased good. These two sets of needs will interact to determine attention -- which information the purchasing manager allows himself or herself to be exposed to (selective exposure), and which information will he or she remember, given attention and exposure. There is a possibility of considering rational information only if all three of these social filters allow the sales presentation to pass through.

De Rose [1991], on the other hand, argued that selling to an industrial customer is not a personal role, motivated by psychological or emotional factors. Industrial requirements do not reflect personal wants; rather, they are determined by a formal discipline and procedures. De Rose suggested that too much emphasis has been placed on the psychology of selling.

Supplier selection appears to be a combination of rational and nonrational factors. This, together with the fact that the supplier’s offering is much broader than the physical product itself, poses greater difficulties for the SMM to understand why and how customers buy but also leaves much more room for the SMM to influence customer decisions.

2.9 Managing a portfolio of customer relationships

Previous sections have pointed to the importance of individual customers in industrial markets. From an accounting perspective, Kaplan [1994a] identified the following as characteristics of low profit and high profit customers (Table 2.1).

Low Profit Customers	High Profit Customers
Small order sizes	Large order sizes
Order non-stocked (custom) products	Standard products
Order low margin products	Order high-margin products
Receive large discounts	Little discounting
Unpredictable orders	Predictable orders
Changes in order requirements	No changes in requirements
Expensive to deliver and install	Inexpensive to deliver and stock
Require large amounts of pre-sales support	Little pre-sales support (they’ve done their homework and already checked you out)
Technical advice and support	
Extensive selling effort	
Require extensive post-sales support	Little post-sales support (they know how to use your product)
Field Service	
Technical support	
Working capital tied up in dedicated inventory and long accounts receivable collection period;	Pay bills rapidly and accurately; no dedicated inventory or equipment required to service them
Specialised equipment required to produce the product or service for this customer	

Source: Kaplan 1994

Table 2.1 Kaplan’s characterisation of high vs. low profit customers

Cespedes [1995], on the other hand, suggested that key accounts have the following characteristics:

- key accounts purchase in significant volume from the vendor, both in absolute dollars and as a percentage of the vendor's sales in that product category
- purchasing involves multiple buyers and influencers, often from several functional areas
- purchasing may also involve a number of geographically dispersed organisations at the account, e.g., multiple stores, branches, or manufacturing plants; and
- the account expects specialised attention and services in areas such as logistical support, inventory management, customised applications, and/or ongoing information about product usage.

Shapiro [1991] sketched a profile of customers who should be candidates for strategic relationships. He suggested that such customers should exhibit the following characteristics:

1. A leading-edge technical and/or operational capability
2. A willingness to share in joint technical and/or operational development
3. A willingness to make the vendor an important part of the customer's business activities, including frequent meetings with a wide variety of functional units within the customer organisation
4. Substantial sales potential
5. Long-term profit potential
6. An existing relationship as a basis for partnership
7. Good cultural fit

The realisation that close relationships require a heavy commitment of resources, led Shapiro [1991] to suggest that the supplier should attempt to use transactional relationships as much as possible, since they are cheaper and easier to implement and administer.

Chase and Garvin [1989], in discussing the characteristics of the service factory, suggest that the best customers for targeting include demanding, sophisticated, or technologically advanced customers because serving them gives a supplier insight into the needs of more ordinary customers.

There seems to be a clear contradiction here: what Cespedes [1995], Shapiro [1991] and Chase and Garvin [1989] consider to be “key” or “strategic” accounts share the common characteristic of being demanding customers who may require heavy commitment of resources. It is these customers that, according to Kaplan [1994], are likely to be low profit customers. What the accounting perspective fails to capture [see also Bellis-Jones 1989, Dudick 1987, New 1996, Shapiro et al. 1987] is that customer relationships are often long-term and dynamic phenomena. As Cespedes [1995] suggested, customer selection decisions that do not look beyond the order can lead to serious mistakes. Capacity utilisation and customer maintenance factors, as well as the customer’s bargaining power help determine the supplier’s net margins and the cumulative cash flow history of the relationship.

A second important point concerns the interrelationships between individual customer relationships. Suppliers should constantly examine which demands they can meet and leverage in dealings with other customers. Cespedes [1995] also emphasises the need to consider the structure and offering of support services since this is an essential characteristic of dealing with key customers. An important element of the customer selection process should be to identify similar customer needs so that the supplier can (1) invest in those capabilities valued by multiple key customers; and (2) in so doing, accelerate learning and support excellence in selected areas so that the supplier can cost-effectively standardise the provision of customised support services to its key customers [Cespedes 1995].

The realisation that close relationships require the commitment of heavy resources on the part of the supplier, and the need to consider interactions between individual customer relationships, point to the idea of a portfolio of customer relationships.

Theoretical work in this area has been limited. Variables that are used to distinguish between types of customers include relationship value and interest commonality [Krapfel et al. 1991], strategic importance and difficulty of managing the account, customer's business attractiveness and strength of buyer/seller relationship [Fiocca 1982], potential for future business, market share [Campbell and Cunningham 1983]. All suggested portfolio schemes consider the issues of competition and balance of power between supplier and customer, and are based on the combination of the above variables to provide guidelines for investing or withdrawing from individual accounts [for a comprehensive overview see Turnbull 1990].

While the importance of individual customers in industrial markets is generally acknowledged, confusion characterises the discussion on which should be considered as better customers to serve. An accounting perspective that focuses on the order without looking at the history of the relationship and wider issues of competition as well as synergies between different customer relationships favours standard, undemanding, unsophisticated customers. Is this a recipe for success and growth?

2.10 Relationship management activities of SMMs

According to Webster [1994], the ability to understand customers and their needs is a fundamental aspect of the marketing concept. Management must understand how customers define value, based on their needs, wants, and product use systems, and how they evaluate the firm's offering relative to those of competitors.

Market orientation, as a manifestation of the adoption by a firm of the marketing concept, has received increased interest in recent years [Shapiro 1988, Webster 1994, Narver and Slater 1990, Jaworski and Kohli 1993]. Jaworski and Kohli conceptualised market orientation as: (1) organisation-wide collection of market information; (2) dissemination of information among functions; (3) organisation-wide responsiveness to such information. These activities are posited to create superior

value for customers in the form of products and services [Narver and Slater 1990, Jaworski and Kohli 1993, De Rose 1991].

Chase and Garvin [1989] introduced the concept of the *service factory*, pointing out that [p.62]: “*The manufacturers that thrive into the next generation, then, will compete by bundling services with products, anticipating and responding to a truly comprehensive range of customer needs*”. A major characteristic of the service factory is that the task of getting and keeping customers - which was, in previous sections, identified as a critical one - becomes the responsibility of the whole organisation and not only of certain functions. Factories become service factories when their managers and workers understand customers’ needs as deeply and directly as they know their own products. To this end, production workers and factory managers are in direct and continuing contact with customers. Before the sale, the aim is to get a clear idea of what customers need and what features would satisfy them. During the manufacturing process the aim is to incorporate any necessary changes in the product. Finally, after delivery, the aim is to learn what features have worked and what the customer needs for maintenance, repair, replacement, etc..

Understanding customer needs and expectations is at the heart of the *service-profit chain* as conceptualised by Heskett et al. [1994]. The authors cite examples of companies in which all employees, including top management, periodically work in the customer service area to get a feel for customer needs and for the quality of services their companies offer to customers.

Interpersonal contacts between buyer and supplier companies have been identified as performing vital roles in problem solving, in exchanging social values and information and in demonstrating commitment to, and credibility with, the other party [IMP Group 1982, Cunningham and Homse 1986, Shapiro and Bonoma 1983]. Cespedes [1995] argued that especially in industrial markets, the relationships that develop among people in buying and selling organisations have intangible but real value. Given the importance placed in this study on the service aspect of the

supplier's offering, it should be noted that services are typically people-intensive, thus increasing significantly the number and diversity of people interfacing with the customer [Hart 1984].

The role of personal contacts in accumulating knowledge about the customer appears to be important for market segmentation purposes. Bonoma and Shapiro [1983] identified three major reasons to segment a market:

1. to better understand the marketplace as well as how and why customers buy
2. to choose for targeting those segments that best fit the company's competence
3. to facilitate the development of strategies, plans, and programs to meet profitably the needs of different segments.

Their nested approach to segmenting an industrial market suggests that the industrial marketer might have to proceed from general, easily observable characteristics about industries and companies to specific, subtle characteristics such as purchasing approach, situational factors, and personal characteristics. It follows that personal contacts might be the most appropriate way to gather information on the latter characteristics.

Hakansson et al. [1990] suggested that, if a firm wants to demonstrate a high need solving ability, it must be organised so as to make contact with customers easy in both depth and breadth. The authors' practical experience suggests that the strategic importance of the organisation as a means in Industrial Marketing is underestimated.

In the context of communication with customers, the use of information technology has been suggested as an important mechanism for facilitating cooperation. According to Bensaou and Venkatraman [1995], information technology represents one of the mechanisms used to increase inter-organisational information processing capabilities and reduce task uncertainty. Christopher [1992] argued that technology is key to the efficient management of logistics relationships. Across a number of industries, ranging from retailing to automotive, information technology enables the timely and accurate exchange of information such as forecasts and production schedules,

manufacturing orders and shipment orders status, actual sales data and stock levels [Christopher 1992, Lamming 1993, Szymankiewicz 1994, La Londe and Masters 1994].

Customer orientation, the *service factory*, and the *service-profit chain* point to the role of service as part of the supplier's offering to customers. They particularly address the processes by which suppliers can understand, respond to, and influence customer needs and requirements. In this sense they provide the conceptual tools for describing the active role of SMMs in supply chains.

2.11 Assessment of the work on the theoretical role of SMMs in supply chains

This Chapter reviewed theoretical work that can potentially provide insight into the role of SMMs in supply chains and their growth potential.

An immediate conclusion is that the two building blocks of this research, that is, SMM growth and SMMs in supply chains remain unconnected. The study of factors that affect SMM growth has not taken into account the emergence of new paradigms of competition and in particular the emphasis on Supply Chain Management. The Supply Chain literature on the other hand, has largely adopted the perspective of the large firm as a customer, and has focused mainly on a few industrial sectors. This constitutes a gap into our understanding of the role of SMMs in supply chains, and hinders the development of broadly applicable theories for Supply Chain Management.

There is widespread recognition of the fact that the nature of industrial markets renders each individual customer important. However, there is much less agreement on fundamental customer attributes such as customer loyalty, characteristics of key customers, dependence and how these may relate to firm success.

Customer loyalty has been suggested as a major driver of profitability [Webster 1994]. The premise that customer loyalty pays off is based on the alleged attributes of loyal customers including lower costs to serve, lower price sensitivity, and higher expenditure with the firm. [see Webster 1994, Cespedes 1995, Heskett et al. 1994, Dowling and Uncles 1997]. Dowling and Uncles [1997], however, point to the fact that these claims have not been empirically substantiated. The literature review shows that the assumed positive effect of customer loyalty on firm success may be an oversimplification of reality; more useful answers may be found by taking into account the dynamic nature of the supplier-customer relationship. Factors such as capacity utilisation [Cespedes 1995, Dowling and Uncles 1997], customer maintenance factors [Cespedes 1995], perceived value by the customer [Shapiro et al. 1987, Dowling and Uncles 1997], as well as the market environment in which the relationship develops [Cespedes 1995], may act to determine the effectiveness of the relationship.

While there are suggestions that factors other than customer loyalty may be in action to determine the effectiveness of the relationship, what constitutes a key customer is not clear at all. In this area, there are mainly two perspectives -- the Accounting and the Industrial Marketing perspective. Expressing the Accounting perspective, Kaplan [1994a] suggests that customers who want standard products, have predictable requirements, and do not require support services, are more profitable. Kaplan completely ignores the dynamics of customer satisfaction, customer service and issues of competition which will determine to a large extent how customers perceive value from the supplier's offering and will influence supplier's margins. He furthermore ignores the interdependencies between suppliers and customers and the fact that rarely if at all, isolated transactions can express trading relationships between organisations. In contrast with the Accounting perspective, the Industrial Marketing perspective argues that key customers are demanding and sophisticated and that serving them requires commitment of heavy resources. Serving such customers may be more rewarding since this provides insight into the needs of more ordinary customers. Provision of services may help to reverse the general tendency of products to evolve

from high margin specialties to low margin commodities. Customer profitability is viewed in the context of the evolution of the relationship over time rather than in the context of individual customer orders [Shapiro et al. 1987, Chase and Garvin 1989, Shapiro 1991, Cespedes 1995]. In this sense, the Industrial Marketing perspective points to the importance of effectively managing customer relationships.

This study chose to adopt the Industrial Marketing perspective since it provides a more realistic view of how industrial markets operate, by acknowledging their dynamic nature. Forrester [1961] has long suggested that industrial systems are dynamic; in this respect the approach suggested by Kaplan can be misleading for those involved in the management and/or study of industrial systems.

There is a general agreement in the literature that inter-organisational relationships emerge as response to various forms of uncertainty and dependence. Uncertainty and dependence are multidimensional constructs. They have been decomposed by various researchers into a number of dimensions, more or less easily observable. These dimensions have been suggested to have an impact on the choice of relationship management strategies pursued by firms. They encompass industry (e.g., fragmentation and heterogeneity of the supplier base, market growth potential, technological unpredictability etc.), as well as product (e.g., product complexity, product importance, customer need uncertainty), company (e.g., relative size, production technology employed, sophistication of procedures, culture) and individual characteristics (culture, risk aversion). Theoretical prescriptions about the effect of these dimensions are not always in agreement. Heide (1994) points to the fact that uncertainty and dependence have been found to imply both close and remote relationships.

In general, however, there seems to be agreement that as product characteristics become more complex, important and difficult to define, relationships will become more important, without necessarily becoming more cooperative. According to theoretical prescriptions, factors such as fragmentation of the supplier's industry,

asymmetries in size between supplier and customer, company culture, etc. may lead to the adoption of command buying strategies. These factors point to the critical importance of power in studying inter-organisational relationships.

The discussion so far has assumed a clear understanding of terms such as “close” or “cooperative” supplier-customer relationships. To what extent is there agreement in the definition of “closeness”? Theoretically derived classifications have generally conceptualised supplier-customer relationships along a continuum ranging from adversarial, “arms’ length” relationships to fully co-operative or “partnership” relationships. The former are typically short-term, price-led, and with minimum information exchange whereas the latter are typically long-term, win/win and information intensive relationships. It has been argued, however, that within a specific relationship, processes from different types of relationships may be combined in different ways [Heide 1994]. The use of general terms such as “partnerships” or alliances has been criticised for obscuring the nature of processes that take place in supplier-customer relationships [Heide 1994, New and Burnes 1995].

Individual customer relationships are embedded in a network of relationships which interact with one another. Cespedes [1995] suggests that perhaps the key for suppliers is to identify and exploit synergies among customer requirements so that they can cost-effectively provide customised services. The need to consider interactions between relationships points to the notion of a portfolio of relationships. Furthermore, Krapfel et al. [1991] have suggested that suppliers may find it desirable to develop a balanced portfolio of customer relationships by developing good working relationships with customers while at the same time avoiding excessive dependence on any customer.

As mentioned earlier, the perspective of the SMM as part of supply chains is underresearched. This review, however, showed that there are tools available to help in the investigation of the role of SMMs in supply chains.

Supplier selection criteria appear to be a combination of rational and nonrational factors. SMMs can potentially shape their role in supply chains by influencing these criteria. Drawing upon Industrial Marketing, a business definition that employs the concept of customer functions provides an appropriate basis for examining the dynamic role of SMMs in supply chains in terms of value added. In Industrial Marketing terms, the supplier's offering is perceived as a combination of tangible and intangible attributes. The physical product, as well as any supplier activities that aim towards reducing or avoiding the customer's pre-purchase and postpurchase costs, constitute the complete supplier's offering [Levitt 1991b, Cespedes 1995, Hakansson et al. 1990, Webster 1994]. These activities are essential for the day-to-day management of customer relationships. Concepts such as *customer orientation*, the *service factory*, and the *service-profit chain* can assist in capturing the service aspect of the supplier's offering. These concepts particularly address the processes by which suppliers can understand, respond to, and influence customer needs and requirements. In this sense they provide conceptual tools to describe the active role of SMMs in supply chains.

2.12 Summary

This chapter reviewed the Industrial Marketing and Supply Chain Management literatures as well as the literatures on factors that affect firm growth to investigate theoretical work that could potentially shed light on the role of SMMs as active members in the supply chains in which they operate. This review suggests that development of effective customer relationships is critical to the supplier's success. It is, however, not at all clear what an effective customer relationship is nor how should suppliers go about developing such relationships. On the other hand, this review points to a number of conceptual tools that suppliers could use to define their business and play an active role in their supply chains. The next chapter seeks to identify what empirical evidence exists about the applicability and effectiveness of these tools, particularly in an SMM context.

CHAPTER 3

EMPIRICAL WORK ON THE ROLE OF SMMs IN SUPPLY CHAINS

3.1 Introduction

Chapter 2 reviewed theoretical work in the Industrial Marketing and Supply Chain Management literatures to examine the role of Small- to Medium- sized Manufacturers (SMMs) as active members of the supply chains in which they operate. As described in Chapter 2, the review sought answers in the following questions:

1. What do customers expect from SMMs in their role as suppliers?
2. What are the problems that SMMs encounter in their dealings with customers?
3. How can the SMMs manage their customer base?
4. What is the impact on SMM's performance of activities for managing their customer base?

This Chapter addresses the same set of questions by reviewing relevant empirical work. This review extends beyond studies which focus exclusively on SMMs. This is done for two reasons: firstly, better understanding of issues such as the determinants and nature of interorganisational relationships require a broader review of studies which deal with supplier-customer dyads even when the supplier is not an SMM; secondly, work focusing exclusively on SMMs is so limited that it becomes necessary to review studies dealing with the SME sector in general and then to interpret findings for SMMs.

3.2 Antecedents of interorganisational relationships

Heide and John [1990] focused on three different forms of uncertainty: volume unpredictability, technological unpredictability, and performance ambiguity defined

as the difficulty of accurately measuring *ex post* the performance of the exchange partner. They found that perceptions of technological unpredictability are associated with lower expectations of relationship continuity, whereas perceptions of performance ambiguity increase supplier qualification efforts. Perceptions of volume unpredictability were not associated with expectations of relationship continuity. They further found that transaction-specific investments were associated with supplier qualification efforts as well as joint efforts.

Bensaou and Venkatraman [1993] found that technological unpredictability plays a different role in predicting interfirm cooperation in the US and Japan. Japanese auto firms tend to establish tight and highly cooperative relationships with suppliers for those components that are likely to undergo major technological innovations. In contrast, US automanufacturers tend to establish loose relationships with suppliers for products with high unpredictability. They furthermore found that mutual understanding in terms of goals and priorities, products and processes, and roles and responsibilities, and an equal sharing of risk, burden, and benefits are associated with cooperative relationships. Finally, the presence of transaction-specific investments was positively associated with cooperation.

Ellram and Hendrick [1995] found that partnerships can equally develop under conditions of high and low risk environments.

Bensaou and Venkatraman [1996] discriminated among four different relationship management strategies that auto manufacturers use for managing their supply base, namely *market exchange*, *supplier captive*, *buyer captive*, *strategic partnership*. Factors that influence the choice of a particular strategy include characteristics of the part or component (standardisation, technological unpredictability), characteristics of the market segment for this product (market growth, level of competition), and characteristics of the supplier (dependence and economic reliance on the buyer and *vice versa*, transaction-specific investments).

According to findings by Bensaou and Venkatraman [1996], supplier concentration and the need for transaction-specific investments mediate the relationship between product characteristics and choice of relationship strategy. Standard products with low rates of technological change may favour *market exchange* under conditions of suppliers' industry fragmentation. The same product characteristics may lead to *buyer captive* relations when the supplier market is oligopolistic. On the other hand, technically complex products with a high rate of technological change will favour *captive supplier* relationships when the supplier has made significant transaction-specific investments and the buyer can easily find another supplier. Technically complex products and subsystems, highly customised, with a high rate of technological change may, however, be candidates for *strategic partnerships* too, provided that both the supplier and the customer have made significant transaction-specific investments.

Heide and John [1990] and Noordewier et al. [1990] pointed out that uncertainty and dependence (including transaction-specific assets) have been found to imply both close and remote relationships. They, however, noted that different researchers have used different definitions and operationalisations and this may in fact have caused the contradictory results.

3.3 Nature of interorganisational relationships

As shown in Chapter 2, the common thread of the theoretically derived typologies is that they conceptualise supplier-customer relationships along a continuum ranging from adversarial, "arms' length" relationships to fully co-operative or "partnership" relationships. The former are typically, short-term, price-led, with minimum information exchange, whereas the latter are typically long-term, win/win and information intensive relationships. In order to investigate the degree of fit between these theoretical models and industrial practice, the literature review sought empirical evidence of the nature and interrelationships between three fundamental dimensions

of supplier-customer relationships -- namely supplier selection criteria, length of the relationship, sharing of risks and benefits, and communication/information exchange.

3.3.1 Supplier selection criteria

Turnbull and Cunningham [1981] analysed the attitudes and experiences of more than 400 buyers of industrial goods in Europe. Their analysis revealed that there are eight major groups of tasks that the supplier must perform in order to be an acceptable supplier and on which they are evaluated by the customer. These tasks are: customer orientation activities, technological expertise, commercial competence, flexibility and adaptability, supply performance capability, price competitiveness, organisational effectiveness, and social integration [adapted from Cunningham and Homse 1986].

Quality [Turnbull et al. 1993, Waters-Fuller 1996] and delivery reliability [Waters-Fuller 1996] are increasingly being seen as *order qualifiers**. Several empirical studies have pointed out the use by some customers of criteria such as R&D [Turnbull et al. 1993], and service, speed, design capability [Waters-Fuller 1996]. Turnbull et al. [1993] identified a trend by vehicle manufacturers towards the use of “first-tier” suppliers that supply complete systems instead of individual components. Increasing involvement and/or responsibility for product design and development [Leverick and Cooper 1998], problem solving and developing ideas for products and processes [Helper and Sako 1995, Pettitt 1992] and a customer preference for product/speciality subcontracting vs. process capacity subcontracting [De Toni and Nassimbeni 1996] have been reported. According to findings by Sako et al. [1994] in the UK there is an increasing number of suppliers who design proprietary parts with no customer involvement. In the UK, suppliers with sole responsibility for design are more likely

* according to Hill [1989], *order qualifiers* are the minimum criteria that the supplier must satisfy in terms of performance in order to be considered for getting the job

** voice relationship was defined as one in which:

- the supplier provides its customer with a detailed breakdown of process steps
- the supplier believes there is a high probability of continued trading with its customer for more than three years
- if a competitor offers a lower price, the supplier expects the customer to help it match the competitor's effort

to be partnership suppliers. These developments may indicate a trend on the customers' behalf to attribute greater importance to supplier expertise.

The influence of price, especially in combination with other criteria, on supplier selection is less clear. Price has been identified as of secondary importance to quality and reliability [De Toni et al. 1996, Pettitt 1992] or as the main criterion through the common use of competitive bidding [Waters-Fullers 1996]. In studies by Helper et al. [1995], and Sako et al. [1994], the trend towards the development of voice relationships** may suggest a shift from price to other criteria. However, it should be noted that these relationships represent a minority of those studied in the automotive industry and, more importantly, firms in voice relationships were found to be reducing their prices, whereas at the same time they were not able to reduce their costs.

Leverick and Cooper [1998] found a high degree of supplier involvement and/or responsibility for product design and development, and an increasing degree of supplier-customer interdependency but, at the same time, the use of competitive bids as equally important as negotiations between supplier and customer and target vehicle price, in determining prices. Choi and Hartley [1996] compared supplier selection practices across different levels in the auto industry: they found that vehicle manufacturers, direct suppliers, and indirect suppliers place the same importance on the criteria of consistency [quality and delivery], reliability, potential for cooperative, long-term relationship, flexibility, price and service. Significant differences were found between autoassemblers and indirect suppliers on the importance placed on technological capability and financial issues. Ellram and Hendrick [1995] found that both suppliers and customers agree that their partnership relationship considers "total cost of ownership" more than item price. The buyers consider "total cost of ownership" to be more influential in their supplier selection decisions than the suppliers think.

3.3.2 Length of relationships

Work by the IMP Group [1982] has underlined the long-term character of supplier-customer relationships in industrial markets. Many empirical studies have demonstrated that supplier-customer relationships are typically long-term [Turnbull et al. 1993, De Toni and Nassimbeni 1996, Holmlund and Cock 1996, Pettitt 1992, Lyons and Bailey 1993]. However, this does not necessarily correspond to formalised agreements [De Toni and Nassimbeni 1996, Waters-Fuller 1996] or the contracts are short-term [Pettitt 1992]. Bidding is commonly used [Waters-Fuller 1996, Leverick and Cooper 1998]. Ellram and Hendrick [1995] found that, even when industrial supplier-customer relationships tend to focus on future transactions and are characterised by a high expectation of a long-term relationship, they still tend to use terminal contracts. Turnbull et al. [1993] and Webster et al. [1998] found that larger companies are more likely to have formalised agreements than smaller ones.

Several studies have suggested that the lack of formalised agreements causes problems for suppliers in long-term planning [Pettitt 1992] and is related to lack of willingness for investments and innovation [De Toni and Nassimbeni 1996, Lyons and Bailey 1993]. Frequent bidding procedures create an additional administrative burden on suppliers [Waters-Fuller 1996].

3.3.3 Sharing of risks and benefits

It is interesting to note that the balance of benefits from supplier-customer relationships appears to favour companies downstream in the supply chain. Empirical data suggest that companies perceive their customers to be the main beneficiaries from developments in Supply Chain Management [Turnbull et al. 1993, New and Burnes 1995]. The findings from Graham et al. [1994] suggest that there have been benefits for suppliers, however to a lesser extent than for customers.

An important consideration appears to be the effect of relationships on the inventory performance of suppliers along with potential cost reductions. According to Helper

and Sako [1995], for example, US suppliers in voice relationships had reduced their delivery batch sizes -- something that benefits their customers -- and at the same time they have reduced their production batch sizes to a greater extent than those in non-voice relationships. At the same time, however, they are reducing their prices without reducing their costs, thus squeezing their margins. Similarly in the UK, Sako et al. [1994] found that suppliers had not achieved much in terms of cost reduction and, furthermore that the gap between production and delivery batch sizes is not in their favour.

Lieberman et al. [1999] used data from “first-tier” suppliers in the automotive industry to suggest that closer communication between suppliers and customers is generally associated with lower inventory. In particular, supplier perceptions of greater cooperation with its major customer, frequent face-to-face contact and receipt of warranty data from the most important customer are associated with lower inventories. The length of the contract as well as the length of the more general relationship with the customer had no connection with inventory levels. In their study of JIT suppliers, Waters-Fuller [1996] found that customer response times shorter than the manufacturing lead time, customer schedule instability, safety stock requirements, and own supplier unwillingness or inability to supply JIT led to increased inventories for JIT suppliers. Ellram and Hendrick [1995] provided a more optimistic view. Their findings suggest that supplier-customer dyads suggests in partnership arrangements perceive their relationship to be characterised by risk sharing.

3.3.4 Communication and information exchange

In the samples they studied, Lamming [1995], De Toni and Nassimbeni [1996], and Krause and Ellram [1995] provided evidence of limited training, technical assistance and support from buyers to suppliers. Lamming [1995], furthermore, found that vendor assessment schemes were largely designed and operated as one-way processes -- from customers to suppliers with limited, if any, feedback to the latter. Leverick

and Cooper [1998] found a high degree of supplier involvement and/or responsibility for product design and development. At the same time, however, they found that communication problems with their most important customer were considered a major obstacle to the relationship. The most frequently encountered communication problem with customers was locating the appropriate person to communicate with in the customer organisation, followed by changes in contact personnel, and a lack of knowledge about technical issues among these personnel. Lyons and Bailey [1993] and Holmlund and Kock [1996] found that long-term relationships do not necessarily correspond to high levels of trust, communications, and adaptations between the firms involved.

Communication also includes the use of information technology to facilitate information exchange between suppliers and customers. Christopher [1992], and Bensaou and Venkatraman [1995] noted the growing use of information technology applications such as EDI, electronic JIT, and CAD/CAM transfer to support coordination across organisations.

3.4 Interrelationships between relationship dimensions

The review in Chapter 2 identified the multidimensionality and complexity of interorganisational relationships. Several empirical studies have attempted to provide insight into associations among different dimensions of relationships. Monczka et al. [1995] found that participation in joint programmes, assessments of quality programmes, resource dependence, customisation of specifications, transaction costs and co-operation between firms are associated with the exchange of technology and cost information between firms. Nielson [1998] measured “closeness” as the degree to which the supplier firm had established extensive person-to-person contact by numerous functional participants from each firm, and close personal and working relationships. He found, among others, positive associations between closeness, relationship specific investments made by the supplier, the supplier’s sharing of critical, often proprietary information with its customer, joint working, and commitment (measured by the belief on the supplier part for continuity in the

relationship). He further found that closeness mediates the relationship between trust and commitment, thus indicating that trust needs to be signalled through specific actions.

Contrary to Nielson [1998], Leuthesser and Kohli [1995] found that the multiplicity of functional contacts and the breadth of customer personnel in contact with the customer (in terms of hierarchy) are not related to buyer satisfaction. In examining factors that could affect the strength of an alliance, Stuart and McCutcheon [1996] found that measures of information flows and the value of the information the buying firms received from their suppliers appeared to be the strongest determinants of the purchasing managers' perceptions of how well their relationships were performing. Based on their findings, the authors suggest that as the alliance develops, information exchange becomes the critical factor in its sustaining and development over time. Stuart and McCutcheon [1996] distinguished between three basic categories of information that are exchanged -- namely, *planning information*, *performance feedback* and *technological assistance* -- and viewed these as important determinants of long-term alliance success.

Bensaou and Venkatraman [1994] examined the role of information technology in fostering supplier-customer cooperation in the automotive industry. They found that EDI as a coordination technology supports cooperation across organisations. Stump and Sriram [1997] focused on the use of information technology as a coordinating mechanism in the purchasing function. Their findings suggest that the use of information technology was positively associated with closer relationships. Ellram and Hendrick [1995], on the other hand, found that the use of information technology was not a major element in close, collaborative buyer-supplier relationships.

Krause and Ellram [1995] focused on the supplier development activities of US firms. Factor analysis on the activities pursued by respondents led to identification of three groups of activities. Factor 1 included formal and informal supplier evaluation, feedback of evaluation results, supplier certification programs, requests to improve

performance, supplier site visits, inviting the supplier's personnel to the buying firm's site, supplier award programs, and training and education of supplier's personnel. Factor 2 included "promise of current benefits such a higher volume order for the present item" and "promise of future benefits such as consideration for future business". Factor 3 included the use of 2 or 3 and the use of 4 or more suppliers for the specific purchased item in order to create competition among suppliers. The authors suggested that the items in Factor 1 involve the buying firm's committing resources to help the supplier improve performance and therefore are considered to be indicators of a co-operative relationship. On the contrary, the items in Factor 2 do not represent any real commitment on the part of the buying firm.

JIT II is perhaps the most advanced co-operative arrangement reported in industrial practice [Dixon 1994]. As described by Dixon, JIT II is characterised by the existence of a supplier employee who is located permanently in the customer's premises (in-plant supplier representative). Depending on the application, the "in-plant" may assume a number of roles such as joint production scheduling, concurrent engineering, etc., previously performed by separate people in the supplier and customer organisations. Even in such arrangements of high trust and cooperation, the customer frequently invites bids for new, or for repeat jobs, in an effort to keep up with market developments. This is not seen as unfair to the in-plant supplier. Due to its privileged position and knowledge of customer needs, the supplier is expected by the customer to outperform competition.

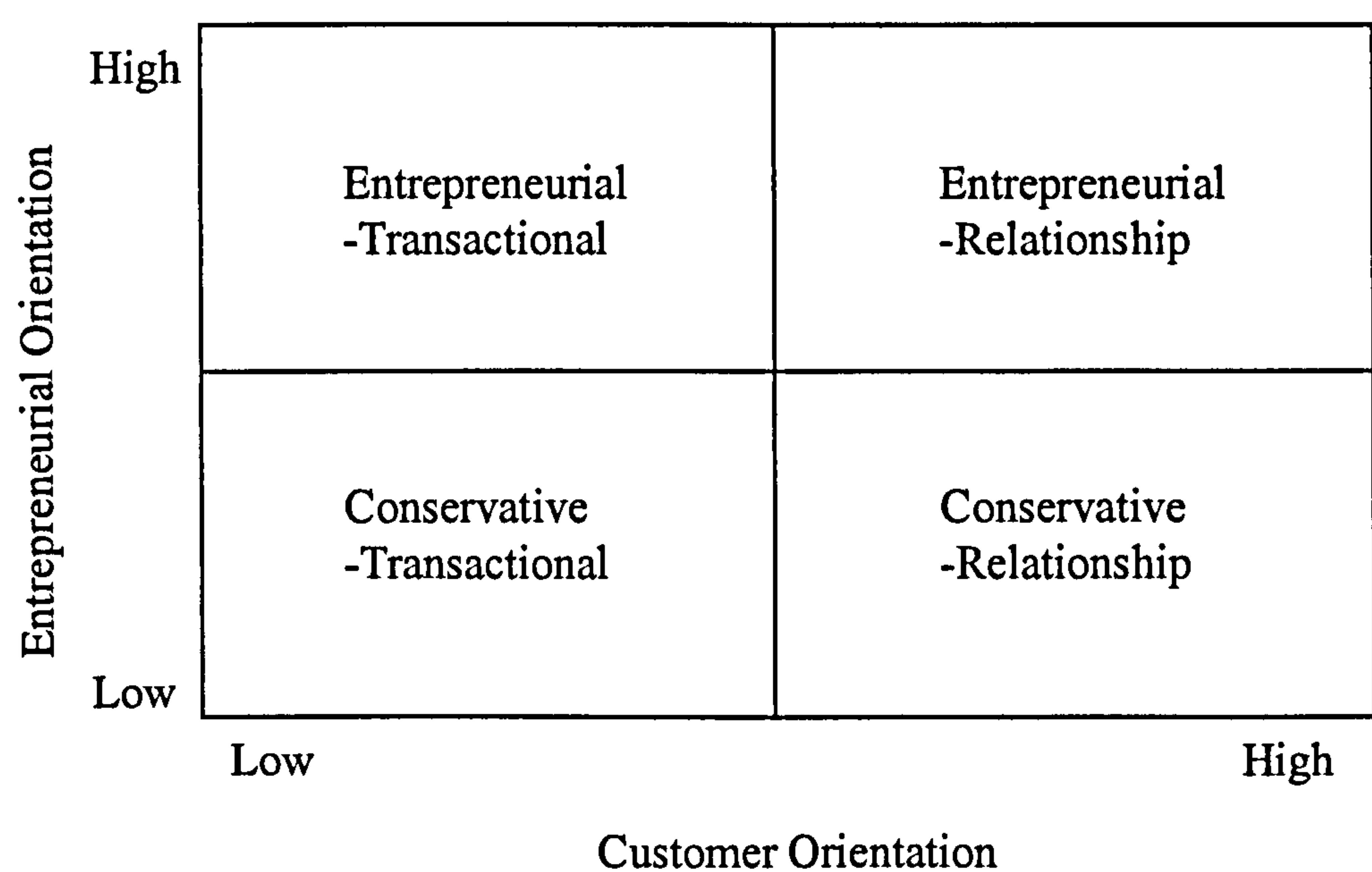
Helper and Sako [1995] identified three distinct supplier relationship strategies implemented by assemblers. The first is typified by exit relationships in which suppliers receive only short-term contracts (slightly more than a year on average) and have to compete against many other suppliers primarily on the basis of price; the second strategy refers to voice relationships; and the third strategy is a transitional stage where companies are consistently moving towards a voice relationship

The study by Bensaou and Venkatraman [1993 and 1996] is a more comprehensive attempt to uncover naturally occurring configurations of supplier-customer relationships. Their analysis [1993] included 19 variables describing elements of the environment in which the relationship develops, the degree of interdependence between the two parties, the nature of the tasks involved in the relationship as well as mechanisms used by the two parties for information exchange. Their analysis identified five dominant configurations of supplier-autoassembler relationships in the US and Japan. It revealed that contextual as well as relationship-specific factors lead to types of relationships which may for example, combine high levels of communication with high levels of conflict and adversarial conflict resolution, or the exchange of highly critical and complex products between the two parties under limited information exchange, or use of information technology.

In revisiting their data, Bensaou and Venkatraman [1996] discriminated among four different relationship management strategies that auto manufacturers use for managing their supply base -- namely *market exchange*, *supplier captive*, *buyer captive*, *strategic partnership*. They found statistically significant differences among types of relationships with regard to the product characteristics of the part or component (standardisation, technological unpredictability), the characteristics of the market segment for this product (market growth, level of competition), and the characteristics of the supplier. The ways these types of relationships are managed differ in terms of information exchange, fairness, provision of technical assistance, supplier involvement and/or responsibility for product design. They do not however, follow a sequential pattern.

Chaston [1998] proposed a typology of small hi-tech firms along two dimensions -- entrepreneurial orientation and customer orientation (see Figure 3.1). According to this typology, entrepreneurial orientation increases as the innovativeness and customisation of products or services supplied by the small firm increases. Customer orientation implies a shift from a transactional approach into forming close relationships with customers.

Using this typology, Chaston found that small firms who operate in markets where customers work in partnership with suppliers to develop innovative new products -- that is, companies in the upper right-hand side of the matrix -- achieve higher sales growth rates. The worst performers in terms of sales growth rate were the conservative-relationship style firms -- that is, firms who operate in markets where the customer is seeking standard specification goods or services but is willing to work closely with suppliers in optimising transactions; examples would be electronics firms supplying components to OEMs who operate with JIT/TQM philosophies.



Source: Chaston 1998

Figure 3.1 Chaston’s Alternative Marketing Style Matrix

3.5 Links between supplier-customer relationships and the dyad’s performance

This review has already reported findings about the unequal sharing of benefits in favour of customers, the mixed (at best) performance of suppliers in voice relationships, and the increased administrative and stockholding burdens for JIT suppliers. To supplement these findings a number of empirical studies provide findings that, when combined, result in a rather confusing picture.

In their study of SMEs across Europe, Voss et al. [1998] found the top performing companies in their sample paying more attention to customer relationships and achieving greater customer satisfaction. Stuart [1997] found that firms that agree that they have a strong alliance report higher levels of productivity and quality over time. On the other hand, longitudinal data provided by Stuart and McCutcheon [1996] suggest that traditional buyer-seller relationships with arm's length transactions were as likely as alliances to show an improved return for the purchasing firms after the two and a half year interval. Kalwani and Narayandas [1995] defined a long-term relationship as one where the supplier firm had made a substantial portion of its sales to the same customer(s) over a 6-year period. Their findings suggest that suppliers in long-term relationships achieve the same level of growth as firms that employ a transactional approach to servicing their customers. Suppliers in long-term relationships are able to reduce their costs over time through better inventory utilisation; at the same time, however, they have to reduce their prices. In comparison with suppliers in transactional relationships, suppliers in long-term relationships reduce their overhead costs (selling, general, and administration costs) to a greater extent, thus achieving overall higher profitability.

Results from the Kalwani and Narayandas [1995] study should be interpreted with caution however, since the study examines only one aspect of the supplier-customer relationship. As shown by other studies, this is not a sufficient indicator of the overall quality of the relationship. Furthermore, there is a question of causation since the hypotheses are at the relationship level, whereas the data are at the firm level of aggregation.

In a study using a sample of two Japanese and all three US car manufacturers and a sample of 50 of their suppliers, Dyer [1996] found positive associations between:

- human asset co-specialisation (measured by man days of face-to-face contact) and new model cycle time and product quality (fewer defects)
- site specificity (geographical proximity) and lower joint investment by suppliers and manufacturers in inventories

- human asset, physical asset (equipment), site specificity and the combined profitability of the supplier-customer dyad.

In their study of supplier-customer relationships in the automotive industry, Bensaou and Venkatraman [1995] found that the use of information technology is generally related to the degree of quasi-integration measured by the percent of total volume sourced by a particular supplier. Differences, however, were found between the Japanese and American industries in terms of how information technology is used. US assemblers did not necessarily exchange more information electronically with those suppliers with whom they do a lot of business. In the Japanese sample, on the other hand, it is the specialised use of information technology that is associated with higher levels of quasi-integration; suppliers that communicate electronically with customers in the engineering function receive higher levels of business from these customers.

3.6 Customer-related growth factors and SMM growth

This section reviews empirical work on relationships between growth and factors which are customer-related. Factors include: dependence, innovation, competition, location, and age.

3.6.1 Growth and dependence on customers

A number of studies have shown that smaller companies are likely to be dependent on few customers [ESRC 1996, De Toni and Nassimbeni 1996, Pettitt 1992, Lyons and Bailey 1993]. New and Burnes [1995] found that focusing on serving a few key accounts is a strategy followed by few companies in spite of the popularity of the partnership concept. Sako et al. [1994] found that partnership suppliers in the UK appear to have greater numbers of customers on average than non-partnership suppliers for any given product: according to these authors this may indicate a lack of

understanding or an unwillingness to recognise the need to focus on a limited set of customers and develop closer, longer-term relationships.

Studies of UK SMEs have shown positive associations between increasing customer base and achieving growth [Smallbone et al. 1992] and between large customer base and total employment [Birley and Westhead 1990]. Eassom et al. [1998] found that the better performing companies in their sample of 12 companies were operating in many industrial sectors in order to spread risk. Holmlund and Cock [1996] found that strong customer dependence had resulted in a weak negotiation position for the small companies they investigated, forcing them to even manufacture unprofitable products. On the other hand, Storey [1994] argued that dependence *per se* is not necessarily related to growth: it is a function of customer requirements, although he acknowledges the high risk that excessive dependence involves. Of three studies that Storey refers to, two have shown no impact of customer concentration on small firm performance and one shows a negative association, leading Storey to suggest that customer concentration appears to be a risky and low return strategy for the firm.

3.6.2 Growth and innovation

Studies have suggested that more rapidly growing firms are more likely to have made new product introductions. A study conducted by ESRC [1996] identified positive relationships between firm size and innovation, and between employment growth and innovation. There are, however, studies that do not find any impact of new product introduction on firm growth [Storey 1994, Birley and Westhead 1990].

Results from the ESRC study [ESRC 1996] suggested that innovating firms were more likely to enter into partnership agreements and that, in general, innovating firms are more likely to collaborate for all reasons compared with non-innovating firms.

The most important reasons were to:

- help expand the range of expertise and products
- to assist in the development of specialist services and products required by customers

- to provide access to UK markets and to overseas markets

The only exception was to help keep current customers, suggesting that non-innovators are far more defensive with regard to maintaining market share.

3.6.3 Growth and competition

Voss et al. [1998] found that operating in niches protects SMEs from price competition, thus allowing higher sales growth. According to Storey [1994], empirical studies have tended to use the number of direct competitors to the firm as a measure of competition. These studies have not been able to identify any clear relationship between subjective estimates of the level of competition and firm growth [see Storey 1994 for a review]. On the other hand, the review by Storey suggests that market positioning -- including the identification of niche markets -- is an important growth factor, perhaps more important than sectoral differences. Different conceptualisations in different studies, however, have provided confusing results. Market positioning of the SMEs in an area which requires further investigation [Storey 1994].

3.6.4 Growth and location

Findings from studies in the UK suggest that firms located in accessible rural areas appear to grow more rapidly than firms in urban and remote rural areas [Storey 1994]. Birley and Westhead [1990] found that nationwide market coverage is related to higher levels of employment and that firms located in “southern” markets experience higher levels of sales.

3.6.5 Growth and age

Birley and Westhead [1990] found that age of the firm is positively associated with growth. On the other hand, empirical studies have suggested that young firms are more likely to achieve significant growth than older firms [Storey 1994, ESRC 1996]. In terms of customer relationships, Eassom et al. [1998] found that older, more

mature companies had a marketing philosophy of customer retention. These companies were not actively advertising their services and relied primarily on word of mouth to expand their customer base; on the contrary younger companies were more proactive and were interested in expanding their customer base.

3.7 Marketing and relationship management activities of suppliers

SMEs -- and in particular innovative SMEs -- are increasingly perceiving competition, inadequate management and marketing skills, and lack of market information as very important constraints of growth [ESRC 1996]. However, most studies suggest that SMEs view their competitive strength in terms of strongly customer-focused criteria such as speed of service, quality, delivery, personal attention to client needs rather than price [ESRC 1996, Voss et al. 1998, De Toni and Nassimbeni 1996, Pettitt 1992, Smallbone et al. 1992, Storey 1994]. Being customer focused may give SMEs a major advantage over larger companies [Voss et al. 1998] and has a positive effect on their performance [Brooksbank et al. 1992, Voss et al. 1998, ESRC 1996, Storey 1994].

Cunningham and Homse [1986] investigated interpersonal contacts between 49 British suppliers of industrial goods and their major customers in France, Germany, Italy, Sweden and the UK. They found that interface in industrial markets between suppliers and customers rarely takes the form of simple dyadic relationships between salesman and buyer or, indeed, of salesmen's face-to-face meetings with different members of the customer's DMU. Several personnel in different functional departments in supplier companies are involved in a network of contacts with their counterparts in the customer firm and this embraces multiple levels in the organisational hierarchy. These contacts develop into a variety of extremely complex patterns as the stages of a supplier-customer relationship evolve over time.

Case study evidence appears to support the notion that some small firms systematically try to develop personal contacts [Holmlund and Kock 1996] and that small firms appear to put emphasis on the role personal factors and networking in

facilitating initial introduction and trial from the customer. Buyers, on the other hand, may be more inclined to dispute the importance of this and place more emphasis on “hard” selection criteria [Pettitt 1992]. By studying supplier-customer pairs, Stuart [1997] found that both parties tend to view the relationships as business exchanges and not personal ones. In their investigation of successful commercialisations of process innovations, Athaide et al. [1996] found that attempts to influence members of a buying centre to encourage support for the innovation is an important activity employed by successful sellers of high-technology process innovations.

The dominant role of the owner/manager of the small firm in controlling contact with customers in strategic and operational issues may limit the ability of the SMM to “penetrate” the customer organisation [Pettitt 1992].

Ellram and Hendrick [1995] found that the ability of the supplier to understand the use by the customer of its product and the mutual understanding of each others’ processes are valued as characteristics of cooperative relationships by both customers and suppliers.

Direct involvement of customers in product development as a means to collect information on market needs is a strategy particularly applicable in small and medium sized firms for which indirect market research studies are often too costly [Karlsson and Ahlstrom 1997, Brooksbank et al. 1992]. Market orientation has been found to have a positive effect on new product success [Pelham and Wilson 1995, Kwaku Atuahene-Gima 1996].

Athaide et al. [1996] identified eight groups of strategic activities which are associated with successful commercialisation of high-tech process innovation: product customisation, information gathering on product performance, product education and training, ongoing product support, influence of the members of the buying centre to encourage support for the innovation, product demonstration and trial, real-time problem solving assistance, and clarification of the product’s relative advantage.

Findings by Yap and Souder [1994] provide support for some of the above activities. However, they suggest that under conditions of high market uncertainty (measured by the market familiarity, understanding of customer needs and ability to translate customer needs into products), small firms should be especially cautious about tailoring the product to individual customers and that they should avoid introducing products that are important purchases for the customers. The premise is that the small firm usually lacks the weight to influence technical standards and the customer perception of stability. Therefore, products that constitute important purchases for the customer may encounter resistance in their adoption.

In a subsequent study, using a sample of small US firms, Souder and Song [1997] found that an emphasis on performance superiority, technical superiority, or radically new products leads to new product failure under low market uncertainty. Even under conditions of high market uncertainty, it was found that compatibility with the customer's installed base was the marketing strategy which led to commercial success for new products.

Yap and Souder [1994] and Souder and Song [1997] consider supplier familiarity with customer needs and processes, and ability to translate these needs into a product, as external factors. Can suppliers control these factors and subsequently influence the outcome of the innovation introduction and commercialisation? Kwaku Atuahene-Gima [1996] found that market orientation has a significant negative impact on product newness to customers and helps to reduce the chances of the firm producing innovations that require major behavioural changes on the part of potential customers for adoption.

A very limited number of studies have provided evidence of the positive influence of market orientation and relational* behaviour on sales at the individual customer level [Leuthesser and Kohli 1995, Kwaku Atuahene-Gima 1996], and at the firm level of

• The term relational is used here to denote the willingness of the supplier to develop and nurture a co-operative relationship with the customer.

aggregation expressed by firm growth [Voss et al. 1998, Pelham and Wilson 1995]. Interestingly, Leuthesser and Kohli [1995] found supplier relational behaviour to be more strongly associated with customer satisfaction when product importance is low.

The manufacturing strategy literature has long suggested that the nature of customer requirements the manufacturing system responds to has important implications for firm performance [Skinner 1969 and 1974, Hill 1989].

According to Sprague et al. [1997]

“An important characteristic of a strategy is that it provides a framework for politely saying “no”... Smaller manufacturers are generally extremely reluctant to pass up any business”.

What is the effect of the existence or the lack of, market requirements focus on the performance of small firms? The extremely limited empirical evidence in this area suggests that diffusion of the firm’s resources into serving diverse customer requirements has a negative effect on performance [Pelham and Wilson 1995] and not only for small firms [Bozarth and Edwards 1997].

3.8 Assessment of the empirical work on the role of SMMs in supply chains

This chapter reviewed of empirical work on the role of SMMs in supply chains. An immediate conclusion is that empirical work in this area is very limited. Studies dealing with the SME sector are few; studies that focus exclusively on SMMs are even fewer. As a result, the review has been much broader; studies that deal with supplier-customer relationships were reviewed, even in cases where the supplier was not, or could not be identified as, an SMM. Effort was made to combine and interpret findings in a way that could be relevant to SMMs. This gap in the literature points to the need for studies that will deal exclusively with SMMs.

The review verifies that research to date has not managed to decisively link customer loyalty, size of customer base, dependence and supplier performance. Empirical studies have provided mixed results with regard to any performance differential caused by customer loyalty, including growth [Kalwani and Narayandas 1995, Helper and Sako 1997, Sako et al. 1994]. Larger customer bases have been associated with higher levels of growth [Birley and Westhead 1990]. On the other hand, researchers have suggested that large customer bases are in contradiction with the partnership concept which calls for focusing on few key customers [Sako et al. 1994, New and Burnes 1995]. Dependence is another grey area. Smaller companies have generally been found to depend on fewer customers [ESRC 1996]. Empirical studies, however, have provided mixed results with regard to the effect of dependence on growth [Storey 1994].

These results suggest that, apart from customer loyalty, dependence, and size of customer base, there may be other factors that shape the nature of customer relationships and should be taken into account.

Looking at empirical studies investigating the nature of customer relationships, the review found evidence of the multidimensionality and complexity of these relationships. Findings support the thesis that the theoretical, sequential models used to conceptualise relationships along a continuum ranging from adversarial to partnerships, are inadequate. Critical relationship dimensions such as the length of relationships, the sharing of risks and benefits, information exchange do not necessarily covary [see Waters-Fuller 1996, Helper and Sako 1997, Holmlund and Cock 1996, Leverick and Cooper 1998, Leuthesser and Kohli 1995, Bensaou and Venkatraman 1993 and 1996]. This becomes particularly important as the most common problems that SMMs perceive in dealing with their customers include communication problems, unfair treatment, limited assistance, lack of customer commitment [see Krause and Ellram 1995, Lamming 1995, De Toni and Nassimbeni 1996, Sako et al. 1994, Leverick and Cooper 1998, Waters-Fuller 1996, Pettitt 1992].

The literature review in Chapter 2 identified a number of conceptual tools that could be used for investigating the role of SMMs in supply chains. These referred both to the physical as well as the service part of the supplier's offering and included defining the business in terms of customer functions assumed as well as concepts such as *market orientation*, the *service factory* and the *service-profit chain*.

Empirical studies suggest that providing expertise, undertaking responsibility for product design and development, and systems supply are increasingly important selection criteria. These studies are, however, primarily limited to the automotive industry and particularly in the relationships between the car assemblers and their "first-tier" suppliers [Turnbull et al. 1993, Helper and Sako 1995, Leverick and Cooper 1998, Choi and Hartley 1996]. Investigation into other industrial sectors or even in more upstream stages of the automotive supply chains is very limited, thus posing the problem of generalisability of identified trends. This is particularly true if one takes into account studies which prescribe a "conservative" strategy for small firms based mainly on findings of limited "weight" of small firms in the eyes of the customer [Yap and Souder 1994, Souder and Song 1997]. Suggestions to small firms for introducing products which do not represent important purchases for customers are in contradiction with reported trends in supply chains for increasing devolution of responsibility for product design and development and supply of complete systems rather than individual components.

Most studies suggest that SMEs view their competitive strength in terms of strongly customer-focused criteria such as speed of service, quality, delivery, personal attention to client needs rather than price [ESRC 1996, Voss et al. 1998, De Toni and Nassimbeni 1996, Pettitt 1992, Smallbone et al. 1992, Storey 1994]. Being customer focused may give SMEs a major advantage over larger companies [Voss et al. 1998] and has a positive effect on their performance [Brooksbank et al. 1992, Voss et al. 1998, ESRC 1996, Storey 1994].

These findings certainly encompass some main service aspects and are related to the conceptual tools of market orientation, service factory and service-profit chain. They do not, however, provide insight into how these may materialise in an SMM context. The review presented in this Chapter found that knowledge on management processes employed by SMMs for the day-to-day management of customer relationships is very limited.

3.9 Summary

This chapter reviewed empirical work on the role of SMMs in supply chains and in particular on the applicability and effectiveness of conceptual tools that can be used by SMMs in developing and maintaining effective relationships with their customers. The next chapter performs an evaluation of the research reviewed in Chapters 2 and 3 with the objective of identifying gaps in existing knowledge about the role of SMMs in supply chains that this research will attempt to fill.

CHAPTER 4

LITERATURE EVALUATION AND RESEARCH METHODOLOGY

4.1 Introduction

Chapters 2 and 3 have reviewed theoretical and empirical work on the role of Small-to Medium-sized Manufacturers (SMMs) in the supply chains in which they operate and its links with their growth potential. The review covered literature from Supply Chain Management, Industrial Marketing, and factors that affect firm growth. An immediate conclusion is that research that deals exclusively and systematically with the SMM sector is very limited. This chapter aims to provide a synthesis and critical appraisal of the results and partial conclusions that have been reported in Chapters 2 and 3. Existing knowledge is used to introduce a model of the central process of understanding, responding to, and influencing customer needs. This model will serve as a theoretical basis for the investigation of the research issue. This chapter finally discusses a mixed research methodology which was adopted as most appropriate, given the nature of the research questions involved.

4.2 Assessment of existing research on the role of SMMs in supply chains

The literature review discussed in Chapters 2 and 3 showed that research on the role of SMMs in supply chains has been very limited. At a general level, research that focuses exclusively on SMMs has been scarce. The Supply Chain Management literature has largely adopted the perspective of the large customer firm and has focused primarily on selected industrial sectors. It has, however, discussed supplier management strategies and documented problems that suppliers face in dealing with their customers – problems such as limited communication and assistance, unfair treatment and lack of co-ordination.

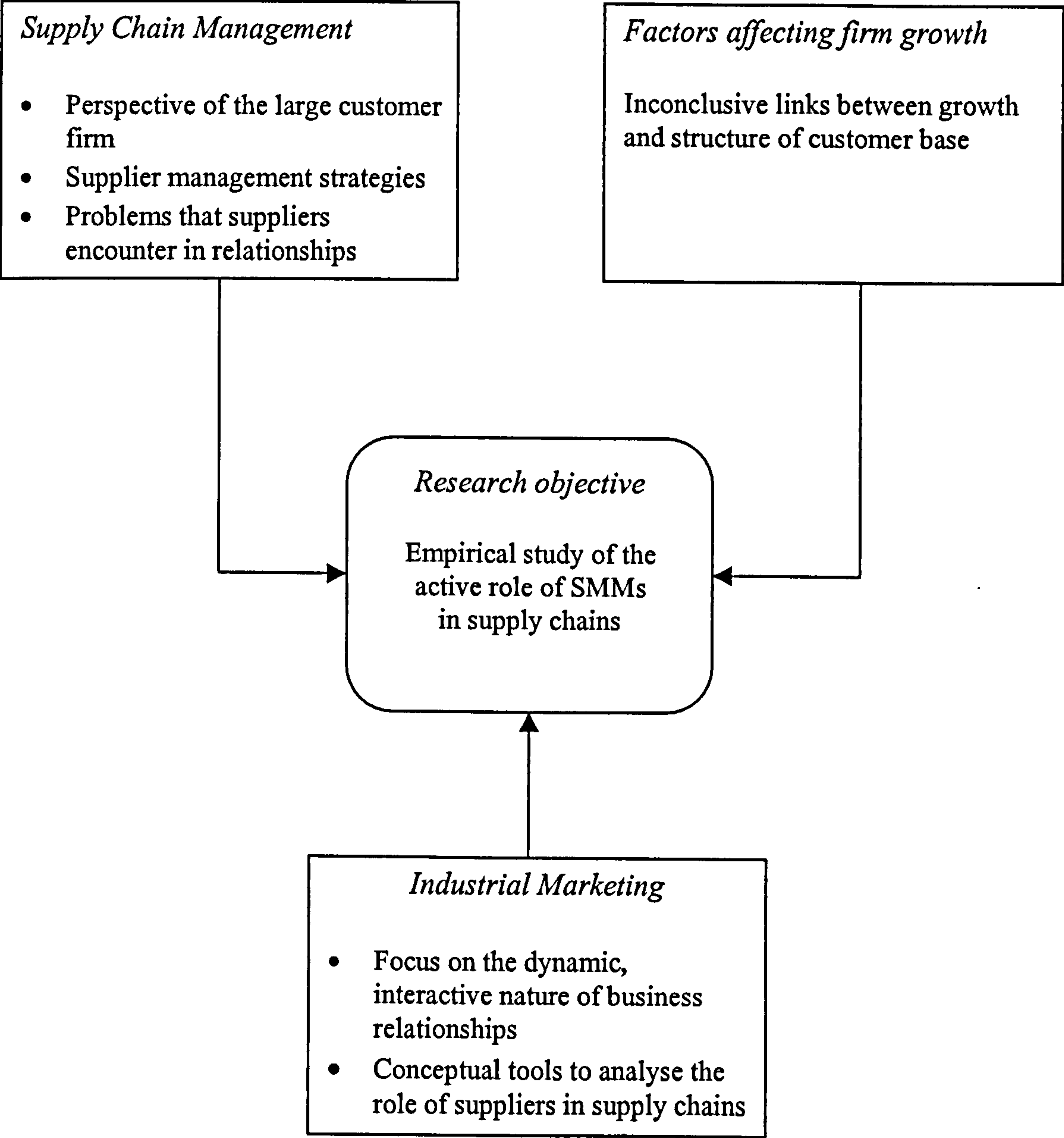
The literature on factors that affect SME growth has failed to decisively link fundamental customer attributes such as customer loyalty, dependence, and size of customer base to growth. As the literature review showed, this is not surprising: there are many additional dimensions of supplier-customer relationships that could be considered. This is further complicated by the fact that, contrary to theoretical models, these dimensions do not necessarily covary in real business relationships.

The Industrial Marketing literature on the other hand, offers several useful tools for investigating the role of SMMs in supply chains. It focuses on relationships and emphasises that both the supplier and customer are active in the relationship. It stresses the dynamic nature of relationships thus pointing to much more useful ways to assess customer importance and profitability than the Accounting perspective which focuses on individual orders. The Industrial Marketing literature also offers a number of conceptual tools such as defining the business in terms of customer functions, *customer orientation*, the *service factory*, and the *service-profit chain* that, at a conceptual level, describe processes by which a supplier may understand, respond to and influence customer needs.

There is, however, very limited empirical evidence showing how these concepts might materialise in an SMM context, and what effect they might have on the SMM's growth potential.

Exhibit 4.1 illustrates how the assessment of existing research led to the identification of a gap in current knowledge about the role of SMMs in supply chains. This study is an attempt to fill this gap.

Exhibit 4.1
Research Contribution



4.3 The process of the SMM’s understanding of, influencing and responding to customer requirements

The review of theoretical and empirical work described in Chapters 2 and 3 aimed to provide tools to analyse the role of SMMs as active members of the supply chains in which they operate. The central theme that emerges from the review is that in order for SMMs to be active in supply chains, they have to manage the process of understanding, influencing, and responding to customer needs. The review findings allow the modelling of this process, as illustrated in Figure 4.1.

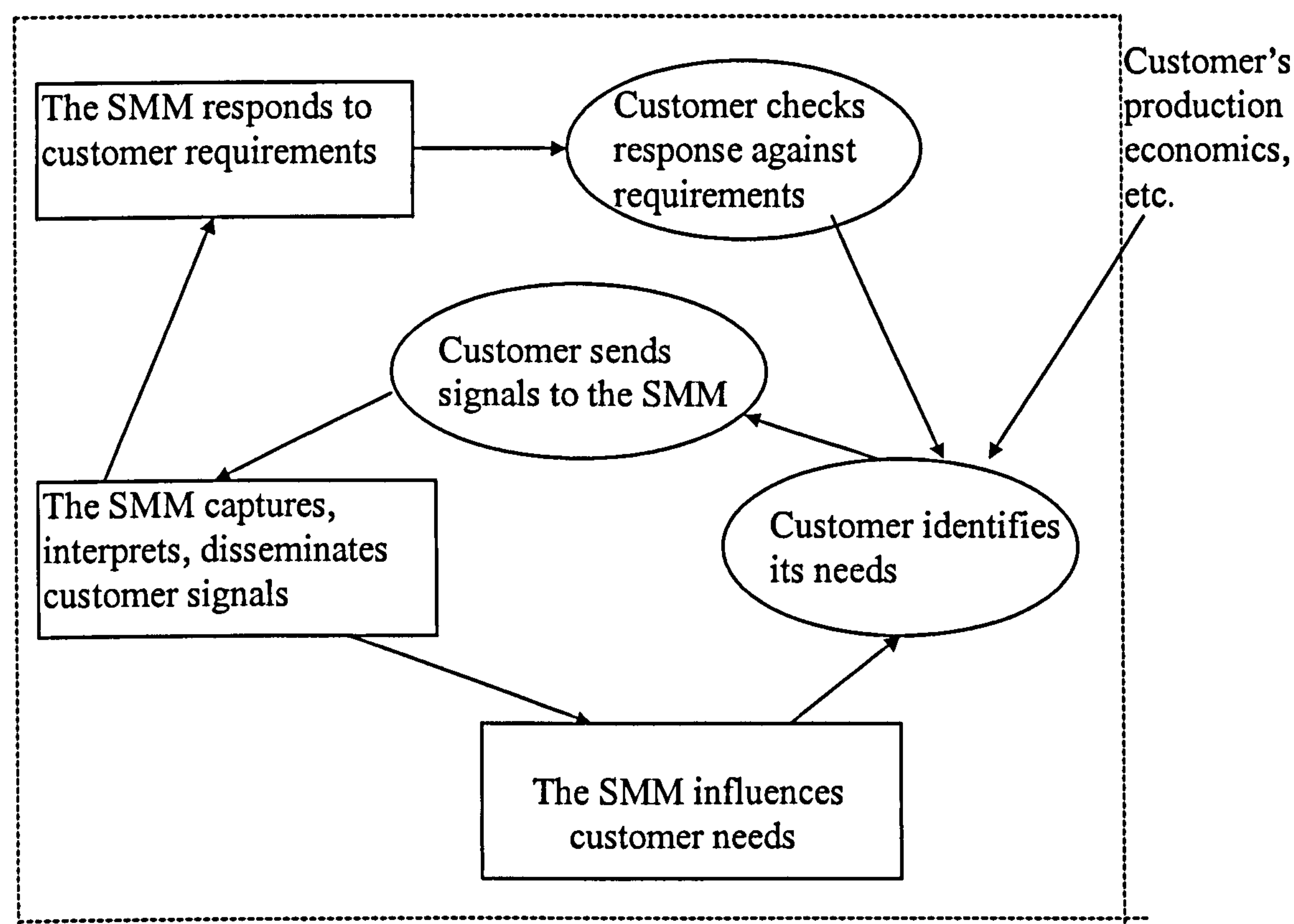


Figure 4.1 The SMM’s understanding of, influencing and responding to customer needs and requirements

The process modelled as above is a dynamic one, recognising the dynamic nature of supplier-customer relationships [e.g., Stuart 1997, Dwyer 1987]. According to Dwyer

[1987] relationships evolve through five general phases: (1) awareness, (2) exploration, (3) expansion, (4) commitment, and (5) dissolution. Each phase presents different challenges in terms of the needs for information exchange, commitment of resources, and demonstrating commitment to the relationship through signalling behaviour.

At any point in time, customer needs and requirements will partly be determined by previous stages of the system -- that is, by supplier response to previous requirements and influence attempts to previous needs. The process refers to dealing both with new customers and with existing customers. The model shown in Figure 4.1 explicitly recognises, as the IMP Group [1982] has suggested, that both the supplier and the customer are active in a relationship. It makes explicit reference to the role of the SMM as a service provider. Service is reflected both in day-to-day operations, and in strategic choices of the SMM in responding to customer requirements, and influencing customer needs. In accordance with the definition of service given in Chapter 2, these choices are assumed to surpass conventional notions of customer service, and include any program or activity which aims to redistribute allocations of roles and responsibilities along the supply chain.

The model makes clear distinction is made between customer needs and customer requirements. Customer needs are driven by factors that may not, in their totality, be visible to the SMM. Furthermore, as shown in Chapter 2, in the discussion of various forms of uncertainty that the customer may perceive, these needs may not be well-defined and will also depend on factors such as the nature of the purchase task (new, modified or straight rebuy), and the supplier's record. Customer requirements are a function of customer needs and customer satisfaction from the SMM's response. Effective management of the process by the SMM is expected to provide the ability to understand and influence customer needs, thus potentially influencing the nature of its relationships with customers. Finally, it should be noted that the process underlies the management of one-to-one relationships as well as the management of the customer base. Effective management of this dynamic process requires that the supplier, as

Cespedes [1995] suggests, constantly examines which demands can be met and which can offer leverage in dealings with other customers.

Having modelled the process, the issue becomes defining what we mean by effective management of this process. Review findings presented in Chapters 2 and 3 emphasise the importance of developing and maintaining close relationships with customers. They also emphasise, however, the dangers of excessive dependence on a few major customers. Given the requirement for commitment of heavy resources that the development of close relationships imply, SMMs are presented with the challenge to structure, as Krapfel et al. [1991] suggest, a balanced set of trading relationships -- that is, developing close relationships and at the same time avoiding excessive dependence on any one trading partner. For the present study, therefore, effective management of the process of understanding, influencing, and responding to customer requirements means structuring a balanced set of trading relationships, as defined above. At the same time, effective management of this process should allow increases in business with existing customers and the addition of business from new customers, thereby increasing the SMM's growth potential.

The central hypothesis of this study can therefore be stated as:

Effective management of the process of understanding, influencing, and responding to customer needs allows the SMM to structure a balanced set of customer relationships and increase its growth potential.

4.4 Research methodology

The evaluation of the theoretical and empirical work in the role of SMMs in supply chains led to two major conclusions:

- Research into the nature and management of supply chain relationships suggests that the underlying processes are much more complex than is generally assumed;

- empirical work specifically targeting SMMs and examining their relationship management activities, as well as the effect of these activities on the nature of customer relationships and the growth of SMMs, is very limited; theories that have been advanced in this area lack empirical verification.

The major questions that the study wants to answer can be formulated as follows:

- What are the relationship management activities of SMMs?
- How do these activities influence the nature of relationships with customers and the growth of SMMs?

Conducting a research project requires decisions about the types of research to incorporate into the project [Neuman 1991]. Having identified the nature of the problem and the general research questions to be answered, the study aimed to identify the types of management research methods that would be most appropriate.

One way of looking at the research process is by examining the role of theory in the context of the specific study. Two research methods can be distinguished, namely the deductive and the inductive methods. These are illustrated in Figure 4.2.

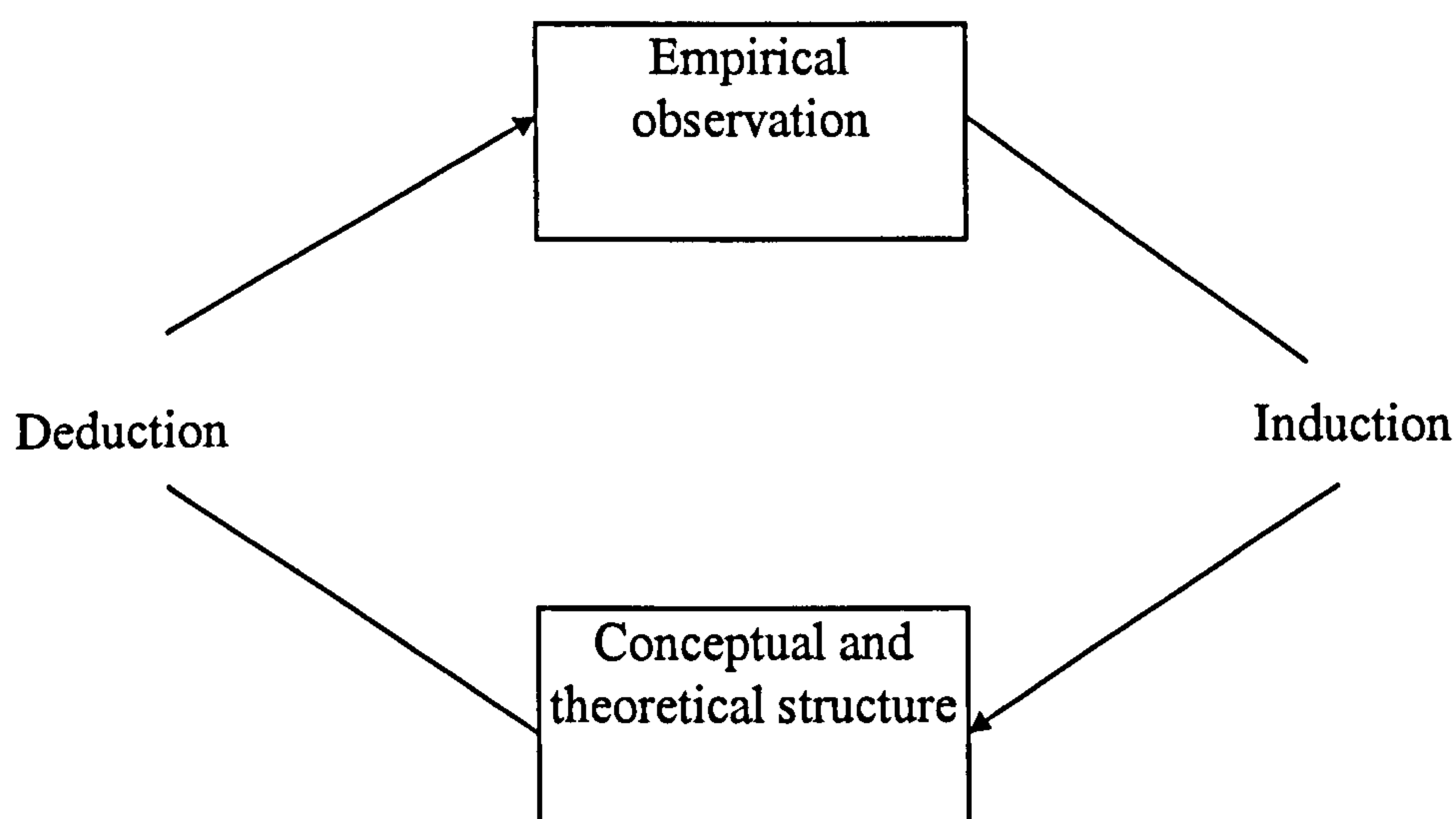


Figure 4.2 The Research Process

As shown in Figure 4.2, a deductive research method involves the development of a conceptual and theoretical structure prior to its testing through empirical observation. the process of deduction encompasses the following three stages [Gill and Johnson, 1991]:

1. Decision on which concepts represent important aspects of the theory or problem under investigation.
2. Operationalisation of the concepts -- i.e., defining the concept in such a way that rules are laid down for making observations and determining when the instance of the concept has empirically occurred.
3. Hypothesis testing -- that is, using measures derived from concept operationalisation to confront theory with data empirically collected. The outcome of this process is theory development, that is, to establish a theory as a valid explanation.

In contrast with deduction, induction adopts a reverse logic in approaching theory development. According to this logic, instead of speculatively imposing a structure on data based on concepts defined *a priori*, it is more appropriate to use empirical observations, analysing the actors' subjectivity by getting inside the situation analysed and using these observations for theory development.

Table 4.1 illustrates a comparison between the methods described earlier. As Gill and Johnson [1991] point out, the researcher should think of the methods available in terms of a continuum where deductive and inductive methods represent the two extremes:

Deduction	Induction
1. Explanation via analysis of causal relationships and explanation by “Covering Laws”	1. Explanation of subjective meaning systems and explanation by understanding
2. Generation and use of quantitative data	2. Generation and use of qualitative data
3. Use of various controls, physical or statistical, so as to allow the testing of hypotheses	3. Commitment to research in everyday settings, to allow access to, and minimise reactivity among the subjects of research
4. Highly structured research methodology to ensure replicability of 1, 2, and 3	4. Minimum structure to ensure 1, 2, and 3

Table 4.1 A comparison of deductive and inductive research methods

Reasons for conducting research can be classified into groups on the basis of what the researcher is trying to accomplish. Based on that, research can be classified as exploratory, descriptive or explanatory [Neuman 1991]. Studies can, however, have multiple purposes thus being a combination of the above types. As Neuman suggests, certain types of research techniques are more appropriate for dealing with specific research purposes. It is therefore, useful to analyse the nature of the research in terms of its purpose.

Exploratory research deals with new issues, or with issues about which little has been written. It can be the first step in a series of sequential studies which will gradually become more systematic and extensive. Descriptive research, on the other hand, implies that the researcher has a more clearly developed idea about the particular phenomenon and the primary objective is to describe a process, mechanism or relationship. Finally, explanatory research builds upon exploratory and descriptive research to provide an explanation of the reasons behind well-known, adequately described phenomena.

Exploratory research frequently uses qualitative techniques. This is apparently due to the fact that qualitative research is more flexible in using many types of data, no matter how unstructured they may be, and therefore is suitable to identify issues that have not been addressed by previous research. Descriptive research, on the other hand, may use a much greater variety of research techniques including, among others, surveys and field research. Finally, explanatory research seldom uses field research.

According to Neuman [1991], descriptive and exploratory research methods have many similarities and are combined in practice. Chapters 2 and 3 provided a review of the current knowledge in the role of SMMs as active members of the supply chains in which they operate. This review identified the complexity of the issues that surround the relationship management activities of SMMs and the nature of their customer relationships. Evidence was provided to suggest that theoretical models, especially with reference to the latter, are an oversimplification of industrial reality. On the other hand, this study's primary aim -- to provide managers in SMMs with useful guidelines for managing their customer relationships -- calls for a research whose results will allow the big picture to be seen, beyond case-specific observations. In other words, this study aims towards the development of generally applicable theory following deductive reasoning. It does, however, recognise that the complexity and the limited knowledge on the issues that are to be addressed requires the use of qualitative techniques in the early stages of the research to help identify key issues (and therefore concepts) that are of concern to SMMs and how these may be dealt with. The research therefore is predominantly a combination of exploratory and descriptive research following the deduction method. A mixed methodology will be adopted. This methodology will consist of three main stages:

1. review and integration of different theoretical streams in the literature
2. semi-structured interviews with SMMs
3. a general survey

The semi-structured interviews can serve a threefold purpose:

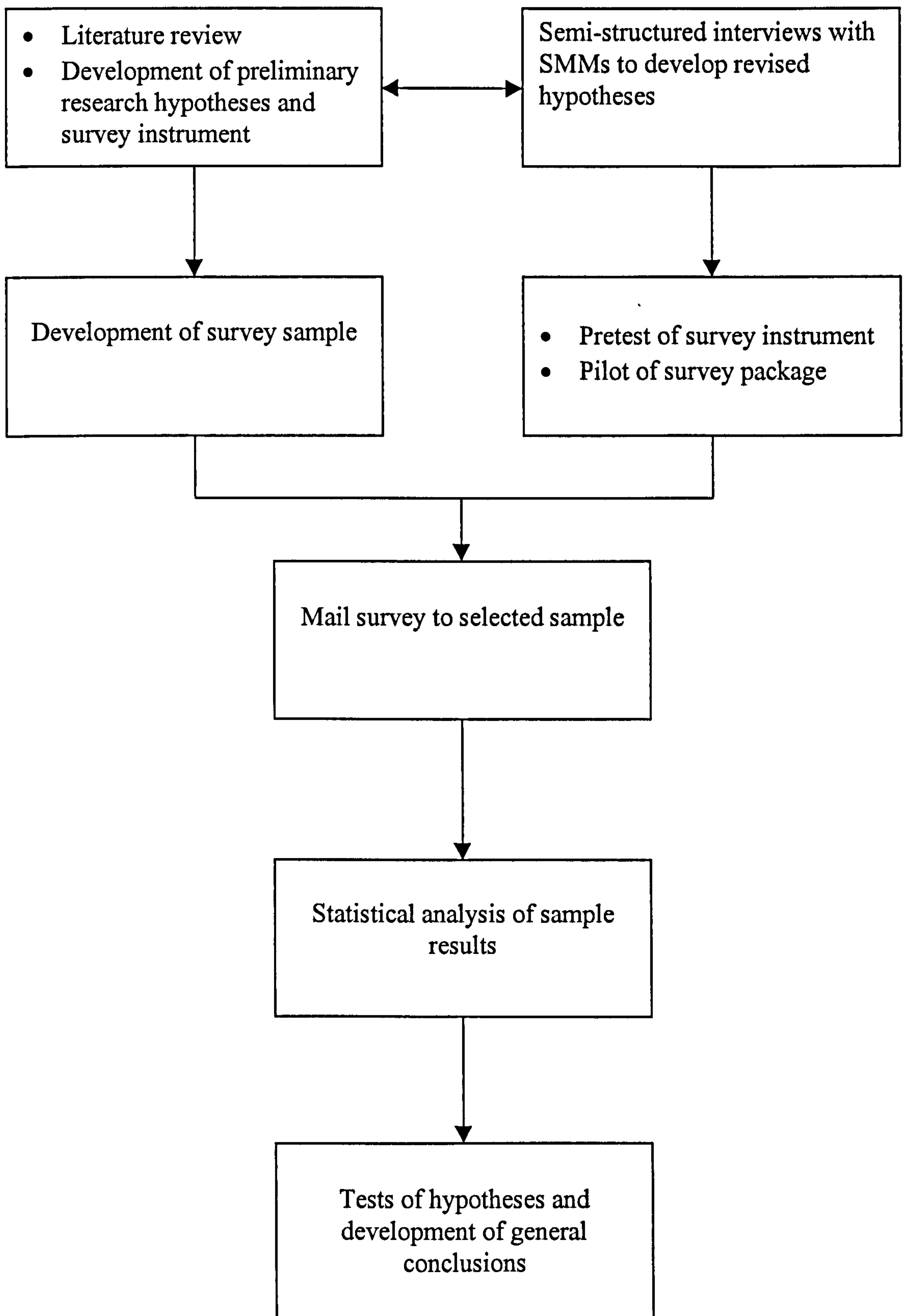
1. to help confirm and identify key issues for SMMs in managing supply chain relationships in conjunction with the literature review
2. to help assess the feasibility of data collection within the context of the SMM sector
3. to provide a richness of anecdotal information which can increase our understanding of business realities that SMMs face.

Properly designed, the interviews can provide information which will help to the development of a valid survey instrument. Data collection and analysis through a general survey can provide the basis for generalisation of results and theory development.

The research methodology adopted for this work is shown in Exhibit 4.2.

Exhibit 4.2

The Research Methodology



4.5 Summary

A conceptual model of the SMM's understanding, responding to and influencing customer needs was developed. This was based on the evaluation of the theoretical and empirical work on the role of SMMs in supply chains, as discussed in Chapters 2 and 3. This dynamic model explicitly recognises the active role of SMMs in supply chains. Its operationalisation will allow this study to investigate how and to what extent SMMs can develop better working relationships with customers and increase their growth potential. Given the level of current knowledge in the research area and the research objectives, a mixed research methodology will be adopted. This includes semi-structured interviews with a set of SMMs and a mail survey. The next chapters describe the application of this methodology for investigating the research issues. Semi-structured interviews with a set of SMMs were used in conjunction with the literature to identify key concepts and develop research hypotheses and operational measures. A mail survey was used to collect data to test these hypotheses. Hypothesis testing allowed the development of general conclusions with regard to the role of SMMs in supply chains.

CHAPTER 5

INTERVIEWS WITH SMMs

5.1 Introduction

Interviews with Small- to Medium- sized Manufacturers (SMMs) were deemed critical in order to confirm and refine findings from the literature review. This Chapter discusses the process which was followed to carry out the interviews, and summarises findings from each semi-structured interview.

5.2 Objectives and methodology

As suggested in Chapter 4, interviews with SMMs were deemed to serve a threefold purpose in the context of the research methodology:

- to help confirm and identify key issues for SMMs in managing supply chain relationships
- to help assess the feasibility of data collection within the context of the SMM sector with a view to performing a mail survey at a subsequent stage of the research
- to provide a richness of anecdotal information which increase our understanding of business realities that SMMs face.

In order to achieve the above it was felt that interviews should be semi-structured; this would provide the necessary flexibility for managers to describe their experience and thereby help influence the research in a direction useful to industrial practice. The central theme of the interviews revolved around relationship management activities employed by SMMs, characteristics of their customer relationships and the business context in which these relationships develop.

Candidates for interviews were identified through Cranfield University and Engineering and Marine Training Authority (EMTA) contacts. In each company senior managers were targeted since it was felt that the issues to be investigated required a broad knowledge of

the company's strategy and operational policies. A letter was sent to each manager explaining the general nature of the project and the type of contribution sought. Attention was given not to overspecify the content of the contribution sought allowing the manager to describe his/her own experiences.

Based on the literature findings, a protocol for semi-structured interviews was developed. This included both open and close-ended questions, and sought both qualitative and quantitative data on relationship management activities. The interviews were planned and carried out from February to the beginning of March 1998. After each visit the protocol was updated to reflect information collected; new questions were added and inadequacy of responses to specific answers or inability to provide responses was logged. This process meant that visit by visit, issues discussed became more focused, questions became clearer, quality of data was better and amount of information collected was greater.

5.3 Profile of SMMs interviewed

Overall, ten SMMs expressed willingness to participate in this stage of the research. Table 5.1 shows that these operate in a wide variety of industrial sectors. For confidentiality reasons, the names of the companies have been disguised.

Company	Type of business
A	Industrial automation systems
B	Electrical accessories
C	Automotive components
D	Materials handling
E	Automotive systems
F	Plastic products
G	Automotive components
H	Medical equipment
I	Springs
J	Presswork, welded assemblies, harnesses

Table 5.1 SMMs interviewed: types of business

All SMMs make industrial products. As shown in Table 5.1, the majority operates in the engineering manufacturing industry. All SMMs are located in England and are geographically scattered around the country. None of them is in the Greater London area. All SMMs interviewed were privately held. In terms of ownership, the set of SMMs included independent companies as well as subsidiaries. Smaller as well as larger SMMs are included; the number of employees ranges from 18 to 500 employees.

The author spent approximately half day in each of these companies. Interviewees were top managers, including Managing Directors and Chairmen. In most cases, interviews were accompanied by plant tours during which the author made additional observations and had the opportunity to conduct additional discussions with other managers.

The remaining sections of the chapter discuss the main findings from each interview. Interviews are arranged in chronological order. As mentioned earlier, as interviews progressed, the content and amount of information collected was continually refined and enhanced. This is evident in the discussion of the findings from interviews that follows.

5.4 Company A

Company A is a family held independent company which designs and manufactures industrial automation systems for a wide range of applications. Its product range includes automatic assembly, automatic inspection and test, programmable positioning, resin impregnation, automatic adhesive and sealant laying, automatic welding, high speed machining of aluminium and plastics, automatic cutting, drilling and routing and many more. The company supplies a wide range of industries, including the automotive, electronics and white goods industries. The company has a very strong technological background of 35 years in the research, design and development of industrial automation systems.

5.4.1 Growth patterns

The company employs 18 people. In terms of growth the company has remained stable over the last years.

5.4.2 Relationships with customers

Its customer base includes many of the largest companies in the automotive, electronics, and white goods industries.

The company initially started as a project type business. The management however saw growth opportunities in moving to a product type business. In making this transition the company relied on the technological expertise of the founder to determine its product range.

The company relies on its technological expertise to get the business of customers. Following each initial enquiry, company engineers consider the specific application. A demonstration unit is available on the company's premises where customers are invited to attend a demonstration of the equipment and its performance and consult with the

company's engineers. Following the installation and commissioning of the machine, the company offers a product support contract scheme to service the equipment.

The range of services offered does not seem to favourably affect customer behaviour, which according to the Chairman is unfair. Customers do not seem to appreciate the high technological content of the company's products. This is reflected in the prices they are willing to pay. There are no long-term contracts and the company works on an individual order basis.

Communication with customers is of course, intense from a technical point of view. Engineering changes are the norm in this business as customers build their plants and there is a continuing update in product specifications.

While the company relies heavily on its technological expertise, its marketing activities appear to be less co-ordinated. A few months prior to the time of interview, the company had launched an advertising campaign in trade journals with a worldwide readership. This campaign generated a stream of enquiries from potential customers around the world. Due to its limited resources, however, the company could follow up only a small part of these enquiries. The management took particular pride in the reach of its campaign but did not seem particularly concerned with the potential impact on the company's image.

Lost opportunities potentially appear in the day-to-day communications with customers too. The employees that are responsible for servicing the equipment are in contact with engineers in the customer organisation. In their visits to customer sites, their job is restricted to performing the service tasks involved. No attempts are made to influence customer uncertainty or to gather market intelligence.

5.5 Company B

Company B is a manufacturer of electrical accessories for domestic use. It was established in 1978 and since 1994, it is a wholly owned subsidiary of a group

comprising seven companies. It operates in a very price-competitive industry which faces stiff competition from lower cost countries, especially China.

5.5.1 Growth patterns

Over the last years the company has experienced stability in terms of sales and employment growth. It employs 120 full-time and 30 part-time employees and its turnover is £12 million.

5.5.2 Relationships with customers

The company sells to contractors. A major characteristic of the market they serve is that customers want to buy the complete range of products from a single source, for example, all the switches and sockets required for a house. The customer who does not find a specific variant is very likely to turn to a competitor for the complete order. In this environment, product availability and variety are critical factors for getting customer orders. The company currently manufactures 90% of its products for finished goods stock. The rest 10% is tailor-made to a specific customer request. Usually however, the modifications are minor. The aim is to manufacture 100% to stock. The main point of product differentiation is in packaging.

The company keeps 8 weeks stock on average. Order sizes vary tremendously: for the same customer and the same product size can vary from 20 to 20,000 units over time. Demand is highly seasonal but apparently predictable to a large extent.

The estimated annual production volume is 20 million units. Within this high volume, high variety environment where new variants are added frequently to meet customer demand for full range and low prices, an emphasis is given in closely monitoring labour and materials costs.

Relationships with customers focus on the actual transaction. The company does not bid for jobs and takes orders on the basis of product availability. Data on the total number of customers is not available, but they are in the hundreds. About 10 customers account for 50 to 60% of their sales.

Some customers exhibit a higher frequency of purchases over the years. Without having any formal agreements, the company negotiates prices with some of its “loyal” customers on an annual basis. Prices are generally cheaper than the competition. Some times the company may import specific items which are cheaper to buy than manufacture in house, or use different materials. These changes are not always communicated to the customer. In such an environment, policies aiming at positioning the product in terms of its benefits for the customer are largely irrelevant. The single crucial parameter is extensive product testing in order to meet safety regulations set by British standards.

5.6 Company C

Company C operates in the steel fabrication industry. They supply parts to the automotive industry. It is a wholly owned subsidiary of an engineering group comprising five subsidiaries. The company is characterised by a “family” culture which is heavily influenced by the catalytic personality of the owners. In terms of competition, there are a lot of players in the UK steel fabrication business.

5.6.1 Growth patterns

The company increased its workforce from 90 employees in the early ‘90s to 200 employees in 1997.

5.6.2 Relationships with customers

Customer base is small. In the early ‘90s they had only one customer. In 1997 they had 5 customers with their largest customer accounting for 75% of their business.

The company has a limited product range. They manufacture to a customer's specific request. The company does not formally undertake any design work. They work on the blueprints sent by the customers. Design specificity, however, is not very high. There are many cases where customers' engineers expect Company C to come up with solutions, for example, weldings, due to lack of knowledge of processes or ability to check the quality of the parts. The company also undertakes prototype work. Management views the company's competitive advantage in terms of its ability to consistently offer high quality in terms of conformance to customer specifications and reliable deliveries

The company has no formal contracts with any of the customers. Their largest customer uses dual sourcing. The relationship with this particular customer extends over a period of 20 years. This customer issues purchase orders for three months. Although the formal policy of the customer is not to have overdependent suppliers, in practice this policy is not implemented. The management of the company would like to see a formal agreement with the customer. But, at the same time, management believes that the customer does not have any reason to take his business elsewhere. Relationship termination is not considered to be an issue, at least from the Company's C point of view.

Company C has intensive and frequent communications with customers. Quality managers and engineers from customer companies frequently call on the company and work with company staff on ideas for cost reductions and improvements. On the other hand, shop floor employees from the company rarely visit customer sites. The quality manager is the person visiting customer sites most frequently.

Formalised procedures for customer feedback were not in place. One of the owner-managers calls customers on a daily basis to identify any problems, and to keep contact with customers' personnel on a social basis.

No customer provided its master schedule to company A. Delivery schedules provided by the largest customer were very stable. The other customers' schedules, however, were characterised by high instability and caused many problems in production planning and control at company A. At the time of the interview, the manager had to delay the start of the interview for a considerable amount of time; as he explained afterwards he had to deal with a frequently occurring problem; company A had produced a number of parts for one of its customers, according to the schedule provided by the customer. The customer called at the last minute to say that the parts were not needed. This event triggered a lengthy negotiation which ended with the customer finally accepting responsibility and agreeing to pay for the parts.

Prices are largely determined by the customer. Price increases are negotiated, however, there is a pressure for price reductions. What makes up for these pressures is the volume of business that the company gets, and the fact that customers pay promptly (30 days).

The company does not have a sales and marketing department. These functions are assumed by the owner-managers of the group.

All customer orders share the same resources. Production is partially organised into cells. Because of the limited number of customers and part numbers, it is easy for employees to identify at any stage of the process the customer for a particular job. Workforce is organised into semi-autonomous teams. The company turns its inventory 15-17 times a year much higher than the industry average.

The general literacy of the workforce is limited. In terms of job skills, workers are good in the current limited range of products that they handle, but problems arise when new products are introduced in production. Despite the growth that the company is steadily experiencing over the last few years, management is concerned about the ability of the company's workforce to handle the forthcoming increase in workload in terms of volume and in terms of new products.

5.7 Company D

Company D is a wholly owned subsidiary of a North American company. The group is a global organisation with manufacturing sites in North America, Europe, Africa, and Asia. The company is in the materials handling business. It manufactures custom and pre-engineered cranes, stacker cranes, electric and hand operated hoists, wheelboxes, travelling trolleys, storage and retrieval systems etc. The company's products can be found in a wide variety of industries and applications including ports, nuclear, metals production, food and distribution industries. The company's product lines are quite distinct businesses in terms of manufacturing and marketing requirements. This results in different levels of competition across businesses.

5.7.1 Growth patterns

The company has experienced a decline in growth in terms of sales and employment. Company's sales have been reduced from £60 million in 1995 to £50 million in 1998. Loss of contracts resulted in the layoff of some employees and transfer of other into different departments. The number of employees was reduced from 629 in 1996 to 550 in 1998.

5.7.2 Relationships with customers

As mentioned before, the company's product lines are different in terms of marketing requirements. The crane business involves close contact with customers at the design and manufacturing stages helping the customer specify its needs and appropriate solutions. Automated storage and retrieval systems involve the delivery of a turnkey solution. During the last few years the company is employing computer-aided engineering technologies to optimise design. It has also adopted a modular approach for the design of cranes. This has resulted to important cost savings and shorter lead times to the customer. The aftermarket for cranes is a highly important business, too. The company's activities cover inspections, routine maintenance, spare parts, repairs, overhauls and equipment

upgrades and refurbishment. Given the cost of the new equipment the last two areas are increasingly being preferred by customers. The company also provides training to customers in areas that the company has expertise such as materials handling operation and supervision, factory administration and process change management.

About 60% of the company's sales are exports. Distribution and service become possible through the worldwide network of distributors and service centres that the parent company maintains. For the crane business there are about 5 major customers in the UK and they are well known in the company. Given the nature of the business it is very important to keep customers for life. This results in the company placing a lot of emphasis on after sales service. The aftermarket generates more profits than the manufacture of cranes. On the other hand, it is highly demanding in terms of customer service.

The importance of customer retention leads to a design strategy characterised by a systems approach rather than modularity. Individual parts are not interchangeable with parts manufactured by competitors. Until recently the company was giving its customers the crane designs. This, however, gave the customers a greater flexibility in choosing suppliers. A new formal policy was therefore decided, according to which designs are not made available to customers any more.

The importance of assistance in specifying customer need and after sales service does not mean that price pressures are not present, even from customers with whose relationships extend over many years. Recently the company lost a contract to a competitor for the manufacture of a number of cranes for three years due to a 5% price difference.

The standard product lines the company manufactures including standard cranes, travelling trolleys etc. represent a totally different line of business. They are sold through distributors to the final customers and no adaptation takes place. The company does not produce any variant outside its established product range.

The manufacturing organisation reflects the different market requirements that different product lines have. A PWP (plant-within-plant) configuration is implemented on the shop floor. The plant is equipped with modern computer controlled machine tools and is organised in manufacturing cells. The high level of responsibility and autonomy that is devolved to the shop floor is based on a high emphasis given to employee training. Employees are in general very highly skilled.

5.8 Company E

Company E is a division of a group of companies with operations in the UK and many other countries around the world. The group is a major systems supplier to the automotive industry. The particular division specialises in the remanufacturing of systems that the group produces.

Remanufacturing in this particular industry is currently underdeveloped. However, due to EU regulations, it is a market with high growth potential. Competition is currently limited, however, big customers plan to set up their own remanufacturing facilities and this causes particular concern to the company.

5.8.1 Growth patterns

Sales increased from £5.8 million in 1993 to £8.1 in 1997. During the same period, employment rose by 10% to the current level of 125 employees.

5.8.2 Relationships with customers

The specific type of remanufacturing that the company performs aims to bring the used product up to its original specifications. No technological upgrading is being undertaken. The remanufactured products are sold at 75% of the price of a new product. The management of the division is responsible for finding new customers; they are, however,

restricted as to the range of products the company makes. The company manufactures to customer order. Given the threat of competition from the automanufacturers themselves the company was planning to diversify into remanufacturing of complementary products. The specific market was identified as a niche and it was expected that such a diversification could attract new customers but also could be used as a systems selling marketing tool since there was a complementarity with the existing product lines. The management felt that the company had the capacity and the expertise to diversify. They however, were waiting for the approval from the parent company and the feeling was that there is not full support by the group for such a move.

The customer base has also expanded during these years, from 11 customers in 1993 to 16 customers in 1997. Despite the increase in the customer base, dependence has also increased: 2-3 customers account for more than 50% of their sales volume.

Trying to get the business of new customers involves inviting customers on site, explaining and demonstrating their processes to them as well as the benefits that accrue for the customers. Management considers the service they offer to customers as standard in the sense that they have to make the used products as good as new.

Their business is covered by formal, open-ended contracts which are agreed independently of the contracts of other divisions for the original parts. For smaller customers the company studies their historical ordering patterns and uses estimates to develop the sales forecast. The customers provide a three-month schedule. This is used for developing the production schedule. Customer ordering patterns are a clear demonstration of the bullwhip effect. Distortion of real demand starts downstream at the distributor level. Cancellation of orders is a usual phenomenon. There is also a high variation in weekly schedules. An effort is made to set production lots to customer order. This, however, is not easy to achieve. Apart from changes in schedules and order cancellations there are two other major reasons that disrupt the smooth flow of material through the shop floor. These are the delivery patterns of the “core”, that is, the used

products from customers and the supply of parts from suppliers, especially from other divisions of the group.

As mentioned before, customers provide three-month schedules. They, however, neglect to ship the “core”, that is, the used products, or it may be the case that the used products have a high proportion of parts that are not recoverable. Therefore, the customer schedule may refer to a delivery of 100 units whereas, in reality, the company has at hand material for 30 units. Furthermore, problems appear in the internal supply chain in terms of the group. The remanufacturing division operates in the aftermarket. What happens is that there are orders for outdated designs. Outdated designs cause problems in the orders that the company places to its sister divisions.

The above problems result in increased stock and administrative costs and poor delivery performance to customers. The company does not measure inventory performance. A tour on the shop floor however, indicated that a large part is occupied by finished goods stock.

Management has pointed out these problems to customers. However, no action has been taken. The business in general is not considered very prestigious. The company deals with low level personnel in the customer organisation. This is considered by the management as the main reason for the inability to influence customer behaviour.

Pricing policies do not follow a cost-plus basis. The company tries to charge its customers as much as it can. The degree of buyers’ technical competence clearly influences their ability to do so.

5.9 Company F

Company F is a private limited company established in 1970. The company manufactures tension curtains, reusable and disposable containers for a wide range of industries such as food, pharmaceutical, and the oil industries. The market for all product lines is growing.

Product lines are quite different in terms of marketing and intensity of competition. There are however synergies in terms of manufacturing requirements.

5.9.1 Growth patterns

The company has experienced steady growth over the last 5 years. In the period of 1992 to 1997 turnover has increased from £3.86 million to £10.14 million. Over the same period employment has increased from 70 to 190 employees. The company exhibits an increasing export activity: exports accounted for 15% of sales in 1992 whereas in 1997 they reached 30%.

5.9.2 Relationships with customers

Products are tailor-made to a customer's specific request. The company is continuously seeking to expand the range of functions that its products/services perform for the customer; in 1992-1993 the company introduced the "signwriting" process, which contributed to significant growth according to the management. Since 1998 the company undertakes the recycling of containers. The customer usually has a good idea for the application for which the product is required, because it has the equipment already installed. Within the limits of the application, however, the company tries to come up with better solutions and offer suggestions and ideas for improvements.

The company has a large customer base of 250 customers. In terms of size the customer base has remained stable over the last years. The same holds for the distribution of sales among customers: 10 customers account for 80% of sales. Customers are in general much bigger than the company.

New product development is heavily influenced by customers. Usually, the customer approaches the company with a specific problem-application. The company develops a solution for the particular customer and if a market opportunity is identified then this

solution becomes a product, that is, it is added to the product range. Any solution provided is also evaluated in terms of their defined capabilities. They do not undertake any job which involves technology beyond these capabilities.

In terms of customer base expansion, the company undertakes a variety of promotional activities, including telesales, phone calls to customers, visits, advertisements in journals etc. In trying to win new business they quantify cost-time reduction that can result from the use of their products.

The company has some annual contracts with customers. Annual contracts are an industry norm. They are a dual source to 99% of their customers. Relationships with some customers are 20 years old.

The company maintains a network of sales engineers located around the country to serve the customer base. These engineers are trained to understand the customer's problem and to help define the customer's own need. Personnel from the company exchange visits with customers. Their main contacts in the customer organisations are with engineers who are responsible for placing the orders. They notify customers that will be affected from changes in materials, processes etc.. Sales engineers make follow-up visits to customers to investigate customer satisfaction and to gather general market information. These issues are discussed in the company in monthly meetings.

In terms of pricing policies the company tries to keep up with market prices. The overall objective of pricing policies is not to disturb long-term relationships by pursuing a short-term benefit. They do, however, favour customers that appreciate their technical support and supplementary services such as the "signwriting" process.

The workforce are medium to low skilled compared to the engineering industry. Production takes place in a batch shop environment. The production process can be characterised as a flow line. There are no cells. Setups are not a significant factor in the

manufacturing process. Engineering or design changes after the start of production are very rare. Delivery schedule changes on the other hand, are quite common and occur on approximately on third of customer orders.

The company is currently investing in new machinery to increase capacity. Immediate plans include reducing the total customer lead time from enquiry to delivery. The management has identified great opportunities for increasing the response time of the whole process. One of the plans involves the establishment of computer links with customers so that designs are determined and updated faster and with fewer errors than at present.

5.10 Company G

Company G is a component supplier to the automotive industry. It is an independent company. The company faces competition only from the autoassemblers themselves who maintain their own in-house production of the particular components. Direct competition from other companies is virtually non-existent. The market is growing and in the short-to medium term much will depend on the more general trend in the automotive industry towards modularisation. If such a trend continues then it might be the case that the company will face competition from large first-tier suppliers who may set up specialised units to manufacture this component for the autoassemblers. On the other hand high capital costs are a significant entry barrier

5.10.1 Growth patterns

Over the years 1993 to 1997 turnover increased by 33% from £6 million to £8 million whereas employment remained stable at about 110 employees.

5.10.2 Relationships with customers

The company manufactures to customers' specifications. The company does not undertake formal product design and development. It does, however, influence the design by making suggestions for improvements and ease of manufacture. In 1991, a strategic decision was made to focus on the manufacture of a specific type of component, in terms of its functional and dimensional specifications and the production batch size that determine the economics of production.

The company also provides consultancy to customers and foreign companies to set up their own facilities. Given the protection offered by the particular niche, management views consultancy as an opportunity to exchange ideas, keep up with market evolution and explore opportunities for collaboration in a global market.

The customer base has remained stable over the last years. The company has 8 customers and is dependent on two customers for 75% of its sales, having moved towards higher dependence since 1993. The company has long-term contracts with its customers which vary from 3 to 5 years. The company does not always have to bid to renew contracts or win new ones. On the other hand, many times customers invite bids with the sole intention to check market prices. It is then difficult to understand the real intentions of the customer.

Communication with customers is intense and multifunctional. Top management has invested considerable amounts of time in getting to know customer procedures but also to cultivate personal relationships with customer personnel. Personnel from the company regularly visit customers. These include the MD, the sales manager, the quality manager and the technical manager. Customer personnel on the other hand, also visit the company but to a lesser extent. Contacts exist with the quality, logistics, and purchasing functions as well as with technical personnel. Customers are notified for changes in materials, processes etc.. This is normally a contractual obligation. The company receives feedback from customers on quality, delivery and cost performance.

The company does not undertake formal product design and development. It does, however, influence the design by making suggestions for improvements and ease of manufacture. Automanufacturers consider the particular component to be in the sphere of their core business and this makes the acceptance of modifications suggested by the company difficult. It does, however, happen and many times this has negative repercussions, attributed by the company to buyer sophistication. A frequently reoccurring problem involves resolving disagreements on part specifications. Even when design changes are accepted by the customer, drawings are not updated. This results in apparent inconsistencies with the specifications provided by the customer, which lead to fractions at the time of parts receipt by the customer. A series of negotiations is then initiated, which usually requires the intervention of the MD in resolving the disagreement in the short-term.

A lot of emphasis has been given in introducing flexibility in the manufacturing organisation using general purpose machining centres (where the changeover involves only the change of relatively inexpensive jigs and fixtures) instead of dedicated tooling. There is a commitment to investment in new equipment. The workforce is able to perform most jobs. The shop floor is organised into dedicated production lines. The production schedule is frozen for a period of three months. Due to virtually non-existent competition the company sets the delivery dates to customers. The customers provide their production schedules to customers but these are usually unreliable.

5.11 Company H

Company H is a privately held company which has been trading for over 20 years. The current owners bought it in 1993 when it went bankrupt. The company is a manufacturer of products for the healthcare industry supplying lamps for operating theatres, patient rooms, medical examinations as well as control panels for operating theatres. The healthcare industry is highly idiosyncratic in the sense that business is project based. Buying cycle times can be as long as 5 years. Customers include hospitals, intermediate

contractors who specialise in the supply of hospitals with equipment, and distributors. The company sells directly to hospitals and through distributors to individual practitioners. Exports account for 60% of its sales.

5.11.1 Growth patterns

The company has exhibited stability since 1993. Sales turnover is at the range of £800K and the company employs 20 people.

5.11.2 Relationships with customers

Its prices are also significantly lower on average. One reason for that is that the company, through collaboration with independent service engineers and distributors incurs lower after sales service and selling costs.

Products are 100% tailor-made to a customer's specific request. From a manufacturing point of view, product customisation does not present particular difficulties because the products are modular in nature and it is the configuration of the modules that provides the differentiation. Approximately 60% of their orders have reasonable specifications provided by customers. For the remaining, the company has to come up with the best solution. Installation, commission, training in the use of equipment and service of the equipment form the package of the company's offering for the last two years. Synergies exist among product lines, that is, the company provides lamps for a variety of uses in a hospital. Customers favour a situation where they can procure all lamps from a single supplier. Synergies also exist between operating lamps and control panels for operating theatres. Despite the fact that the company has been manufacturing operating lamps for years it is only since last year that it started to use this synergy as a marketing tool.

The customer base is measured in thousands. Marketing activity in the company is intense. Direct mail, participation in exhibitions worldwide, advertisements in trade

journals, visits to customers are used to attract new orders. From the company's side, contact with customers is multifunctional; the Managing Director, sales manager, sales coordinator, operations director, and technical manager are all involved in contact with the customer. A lot of emphasis is being given in interpersonal factors; the management has noticed and analysed that particular customers in various parts of the world prefer to do business with particular managers in the company, partly due to the ability of these managers to better perform marketing tasks in specific cultural and business contexts. Another factor is that some customers prefer to deal with younger people whereas others do not trust them. This knowledge is used as a segmentation criterion and managers are appointed responsible for managing relationships with specific customer groups. Selling techniques include stressing the product's comparative advantage relative to competitors' products and taking potential customers to hospitals where equipment is already installed for a demonstration.

Every contact with customers is used by the company to influence customer needs. In the UK for example, the company collaborates with 3 independent service engineers. These are located in different parts of the country and service equipment installed by the company and by its competitors. These engineers perform marketing tasks on behalf of the company by recommending to customers the use of the company's products. Furthermore, they co-ordinate resources with the company to cover the service needs of their customers and the company's customers. Finally, they provide information to the company with regard to competitors' equipment and buyers' preferences and plans.

This information, along with the company's own design and direct feedback customer are the sources that are used by the company in new product development.

The company employs both exclusive and non-exclusive distributors. Prior to the company's bankruptcy under the previous ownership, a network of about 60 distributors worldwide was installed. When the company was bought by its new owners in 1993, a restructuring of the distributor base was launched. The number of distributors was

reduced to about 15 and relationships with them developed on a new basis. The company views them as partners instead of customers. Company managers visit them and provide them with technical information, marketing material and training.

Building a strong company image is very important to the management. The company is small, young, and competes against much larger and established businesses. The management organises meetings between UK health authorities and overseas customers for issues of interest in the healthcare business. This is thought to reinforce to the eyes of customers the image of a significant player in the healthcare business.

The company is based on small and rather unattractive premises and the manufacturing organisation has certainly great potential for improvement. This is the reason that the management avoids inviting customers to the shop floor. The equipment is quite old, 40-50 years. The workforce is highly skilled and able to perform most tasks. Most of the workers have been in the company for many years.

5.12 Company I

Company I is a traditional family business established in 1945. The company manufactures a wide range of springs for a wide variety of applications as a sub- or sub-sub contractor and to the customer's specifications, and to a wide variety of volumes ranging from one-offs to millions. The product range is vast; the product catalogue serves more as a demonstration of their capabilities. It operates across a wide range of different industries, including the computer and electronics, white goods, lighting, engineering industries as well as individual farmers. Diversification into sectors other than the automotive has been part of the company's strategy, mainly due to the particular norms that characterise the automotive industry.

5.12.1 Growth patterns

From 1993 to 1997 sales rose by 20% while the number of employees remained at the same levels of 75 employees.

5.12.2 Relationships with customers

As mentioned before the company is a primarily a subcontractor manufacturing to customer's specifications. It does, however, offer a full design service and approximately one third of its customers make use of this service. In the past, efforts have been made to develop subassemblies for a specific customer and a specific order. However, there has not been any follow up although management believes that there is the capacity and the skills necessary to successfully undertake such an effort.

In terms of size, the customer base has been relatively stable over the last years comprising about 500 customers. It also exhibits high mobility. In terms of dependence about 20% of their customers account for 80% of their sales volume. Approximately 30% of sales is covered by long-term contracts and purchase orders. The company is a sole supplier to many of their major customers and in general they are single or dual source to the majority of their customers. Single or dual sourcing has been a relatively recent development. Relationships with many of the customers on the other hand, extend many years into the past.

Advertisements in trade directories and phone calls are used as customer getting tools whereas word of mouth is also very important. Many customers made their first contact with the company under emergency conditions or after being let down by their own suppliers. The time it takes to develop a relationship varies from customer to customer. The process takes generally longer with large companies due to more formal procedures that are followed by them.

The day-to-day management of relationships with customers has been given great attention by the management. Communication patterns depend on the type of the customer organisation. With large customers the main channels of communication are with buyers and technical personnel. A team of six people under the sales manager and the customer service department are primarily responsible to work with customers. There is however, a systematic effort to expose as many employees as possible to contact with customers. Clerical personnel for example are trained to call prospects on a rotation basis. Shop floor workers are encouraged to discuss with customers when they visit the shop floor. A few months ago, a unit was introduced in the shop floor which undertakes “unusual” orders in terms of size, technical or time requirements not included in the normal production schedule. The unit is manned with specially trained employees who are responsible for order handling and execution, including determining specifications, invoicing, and delivery dates. The idea originated from a similar unit for custom production which was formed in a foreign company. The success of this pilot unit has encouraged management to pursue its wider application in the shop floor.

The company invests heavily in employee training and development. All employees are involved in development programmes. In this context, employees are trained to adopt a service-oriented language in their communication with customers. Each conversation is logged on so that if the same employee is not available when the customer rings, another employee will be in the position to know the topic of the customer enquiry.

The diffusion of the service-oriented culture within the organisation does not always meet similar response from customers. According to the Chairman of the company, business relationships today, especially with large organisations, are becoming increasingly impersonal. The frequent change of buyers prevents the development of long-lasting interpersonal relationships and mutual trust between the two parties.

The shift of emphasis from interpersonal relationships to procedures does not necessarily suggest that business relationships are becoming more sophisticated. Buyers’ technical

competence is a reason for this. Inability on the buyer's side, as suggested by the Chairman to evaluate the content of the product sometimes leads to tensions. In one instance, for example, a buyer who thought that the springs were standard items, called the company to ask for a delivery on a lead time appropriate for off-the shelf items. He was very annoyed when he was told that some time is needed to manufacture them.

According to the Chairman, the multiplicity of contacts with large customers creates additional communication problems as different departments, for example, purchasing and production scheduling pose different and sometimes conflicting requirements.

The company responds to a wide variety of delivery scheduling policies which are dictated by its customers. Changes in customer schedules occur quite often. An estimate was not available. There are, however, daily incidences. Delivery requirements by the customer are often based on very short notice, often much less than the quoted lead time given by the company. The increasing adoption of JIT techniques by customers has resulted in pressures for the company. Customers require the company to maintain stock and make JIT deliveries to the point of use. There are instances, however, in which a more cooperative attitude is adopted whereby the customer acknowledges that its particular requirements (in terms of response lead times relative to manufacturing lead times) create the need for the company to maintain stock. In these cases, it becomes a contractual term that the customer will finance the inventory.

In 1993, the company attempted to set its relationships with customers on a new basis. Prior to this date, priorities were given to customers based on the pressure they would exert on the company. Pricing policies and negotiations were uncoordinated. This would usually result in price increases across the whole product range. In other instances this would lead to exploitation by some customers. The company would for example, undertake development work for free in the hope of getting the job. Once the development would finish, however, the customer would take its job elsewhere.

Realising these problems the company decided to re-estimate the cost content of a new or existing product each time an order is received. This is used to determine a minimum price to be used as an indicator for the negotiations. In general, the company tries to be in line with market prices and avoid abusing customers. The latter could provide short-term benefits but it is believed that in the long run it would jeopardise the future of the company. Customers are charged separately for development work. Unprofitable items are identified and efforts are made to delete them from the product range. This has resulted in the loss of customers, it is however, been seen by the management as a necessary action.

5.13 Company J

Company B was founded in 1935 and remains a family business. The company is active in two lines of business: presswork/welded assemblies and cables, harnesses and assemblies. It supplies primarily the automotive industry and to a lesser extent the domestic appliance, agricultural, office automation and electrical industries. In the automotive industry it is a second-tier supplier. Competition is high in terms of the number of players.

5.13.1 Growth pattern

Since its establishment the company has experienced a continuous expansion in its product range, capacity and growth. From 1991 to 1998 workforce has increased from 168 to 225 employees and turnover from £5.2 million to £8.2 million.

5.13.2 Relationships with customers

The company tailors its products to a specific customer's request. There are two aspects that the company emphasises in its product/service offering:

- heavy involvement in product design and development and the offer of a comprehensive “design for manufacture” service to its customers

- flexibility and rapid response to customer requirements

The company provides training to customer personnel at various organisational activities. The content of training includes processing techniques as well as business practices (e.g. simultaneous engineering, problem-solving techniques, negotiation skills etc.) which the company has mastered.

As mentioned before, the company operates mainly within the automotive sector in which they have 80% of their business. The company's strategy is to continue to operate primarily within this sector, but also to pursue diversification into other market sectors. Interestingly, however, diversification attempts have been judged by the company as unsatisfactory due to lack of customer sophistication in terms of business practices.

A great emphasis is placed on operations focus. The company concentrates on specific volume ranges and product characteristics and all customer enquiries are reviewed as to whether they fall within the range of manufacturing activities of the company. Where the product does not fall directly within the production activities they consider, with the customer, the alternative of subcontracting. Synergistic effects are also a major consideration in the decision to expand into new lines of business. The company continuously seeks specialisation in niches. Management however, is very active in gathering market intelligence about competition and trends in the industry. This has helped the company to enjoy first-mover advantages in a number of their current lines of business.

The management of the customer base exhibits a particular interest. The company is working on a plan to reduce the number of customers. The aim is to achieve the same levels of turnover by concentrating on a smaller set of customers and winning a greater percentage of their business than by attempting to serve a larger set of customers.

Customers are segmented based on their potential for increasing business with them. The company believes that winning a greater amount of a customer's business can be achieved through better service and through greater and better interaction. Therefore, customers targeted for closer relationships are those which value the company's design for manufacture capability and are willing to work with the company in a simultaneous engineering context.

Realising this plan the company reduced its customer base from 60+ customers in 1991 to less than 30 by 1997. Eighty per cent of their sales is covered by long-term contracts. At the same time dependence on any one customer has been reduced. The company is against single sourcing and views it as a dangerous situation leading to excessive dependence.

The Managing Director is responsible for negotiating and winning new business. Once a contract has been won, the maintenance of the ongoing relationship becomes the task of the salesforce. On a day-to-day basis interactions are with purchasing personnel, apart of course from the technical interactions in the context of simultaneous engineering. The management of the company believes that the provision of this service to customers gives the company a particular leverage in its dealings with customers through its ability to develop close (even at a personal level) relationships with personnel at high levels within the customer organisation.

Customer schedules are characterised by high instability. Changes in schedules after the start of production are the norm with the exception of schedules provided by Japanese transplants which are totally reliable; management however, considers the ability to respond to fluctuating customer requirements as part of the service the company offers to its customers. A great emphasis is given in mapping the process from customer order enquiry to delivery so that delays are identified and improvements are made. Production is organised into cells wherever possible and the workforce is organised in teams. A great emphasis is given in employee training and development. All employees are involved in

Personnel Development programmes aimed at individual improvement and the attainment of the company's business plan.

5.14 Overview of findings from semi-structured interviews

The interviews with SMMs verified findings from previous studies in terms of what problems SMMs perceive in working with their customers [see for example, Waters-Fuller 1996, Leverick and Cooper 1998, Lamming 1995, De Toni and Nassimbeni 1996, New and Burnes 1995]. SMMs largely focus their criticism on customers' behaviour on communication and coordination issues, commitment to the relationship and fairness and consider these to be decisive in the development, or hindrance, of effective relationships.

According to the SMMs interviewed, obstacles in working effectively with customers include:

- Limited influence over important aspects of the relationship, such as ordering patterns and delivery arrangements
- Access to low level personnel in the customer organisation
- Frequent changes in buying personnel which hinder the development of personal relationships
- Conflicting requirements expressed by different customer departments
- Coordination problems leading to a disproportionate amount of time spent on firefighting tasks and resolving disagreements.
- Exploitation by customers who take advantage of the SMM's expertise in design and development and then take their business elsewhere.
- High customer schedule instability
- Customer demands for extreme price reductions
- Lack of customer commitment in the relationship, especially in the form of long-term agreements
- Limited weight of the SMM in the market, especially when competing against larger competitors

On the other hand, a number of activities that SMMs employ in managing their customer relationships emerge. These include:

- the development of product/services aiming at assuming more customer functions,
- company-wide involvement of employees to manage various aspects of customer relationships
- feedback from customers on product and service performance
- the implementation of a wide variety of marketing tools aiming at attracting new customers and/or maintaining existing customers.

These activities, combined with characteristics of the business context in which these relationships develop, appear to influence the very nature of these relationships.

5.15 Summary

This chapter has described the findings from the structured interviews with SMMs across a wide spectrum of industrial sectors. These interviews have provided a wealth of information regarding relationship management activities used by SMMs and how these affect the nature of their relationships with customers. The next chapter will cross-evaluate findings from the literature review and the semi-structured interviews in order to develop a set of research hypotheses.

CHAPTER 6

RESEARCH MODEL, HYPOTHESES, AND OPERATIONALISATION

6.1 Introduction

This chapter builds upon the findings from the literature review and the semi-structured interviews with SMMs to analytically decompose the central hypothesis of the study, as stated in Chapter 4, into a set of testable working hypotheses and to develop appropriate measures for their testing.

6.2 Relationship management activities of SMMs

The literature review and findings from the semi-structured interviews with SMMs suggest that SMM activities for managing their relationships with customers can be analytically decomposed as follows: vertical focus of the product/service offering, devolution of supply chain responsibility to the shop floor, feedback from customers, total acquisition cost approach, and the use of computer links with customers.

6.2.1 Vertical focus of the product/service offering

This study defines the vertical focus of the SMM's product/service offering in terms of customer functions that it performs. As defined in Chapter 2, customer functions describe customer needs, or what is being satisfied [Abell 1980]. Following Abell, customer functions are conceptually separated from benefits that a customer may perceive as important criteria for choice.

Structural elements of the SMM's product/service offering include characteristics of the physical product, as well as pre-sale and post-sale activities that the SMM implements. One aspect of the vertical focus of the product/service offering can be linked to what Hakansson et al. [1997] term *customer need uncertainty*, defined as the buyers' difficulty in interpreting the exact nature of their own needs for materials,

machine, tools, services, etc.. Combined with the importance of the actual need, it defines the degree of uncertainty the buyer experiences. This study, therefore, terms this aspect as responding to customers' uncertainty about their own needs.

An examination of theoretical and empirical work [Cespedes 1995, Kotler 1994, Athaide et al. 1996, Jackson 1985, Beddowes 1984, Chase and Garvin 1989] led to the development of the following list of generic activities that may describe the range of services a manufacturing company can offer in order to help customers define their own needs and thus reduce their uncertainty for their own needs:

- assistance in applications development provided before the sale
- formal product design and development
- ideas to influence design (if not formally undertaken)
- education/training in product use
- consulting in areas of company expertise

The actual product/service itself can evolve in a vertical sense by combining products and/or processes that assume additional/complementary functions previously performed by the customer, other suppliers, or individual earlier products. This study terms this aspect own share of value-added in the supply chain. This definition is closely linked to the concept of systems benefits proposed by Jackson [1985]. As Cespedes [1995] notes, requirements for integrated systems -- once the concern mainly of producers of custom-built capital equipment -- now face firms in many other industrial markets.

To what extent have the companies that were interviewed adopted such a vertical focus?

- Company J offer a full design for manufacture service, have developed subassemblies and products that perform complementary functions in a vertical sense, and provide training to customers on a number of areas of company expertise.

- Company F have developed the “signwriting” process for curtains which was previously performed by other suppliers.
- Company C do not undertake any design work formally but are expected to influence design in areas where the customer does not possess the relevant knowledge and skills.
- Company H have recently started to use systems selling (the offer of control panels together with operating lamps) as a marketing tool.

For firms and for SMMs in particular, the choice of how to define their business forms the basis on which customer relationships develop. Findings from semi-structured interviews suggest that at least some SMMs perceive their role as being solutions providers to their customers.

6.2.2 Devolution of supply chain responsibility to the shop floor

Hakansson et al. [1997] suggest that if a firm wants to demonstrate a high need solving ability, it must be so organised as to make contact with customers easy in both depth and breadth. The *service-profit chain* concept [Heskett et al. 1994] advocates the involvement of all employees in understanding customer needs and expectations. The *service factory* concept [Chase and Garvin 1987] suggests that in service factories managers and workers understand customers’ needs as deeply and directly as they know their own products. In these factories, production workers and factory managers are in direct and continuing contact with customers.

In Company I, devolution of responsibility for tactical customer management is currently implemented at a pilot stage. The management of Company I also encourage shop floor employees to communicate with customers when they visit the shop floor. On the other hand, Company A’s management pointed out that a minority of their own suppliers actually knew how their products are used by the firm themselves as a customer. Company A regularly invite their own suppliers on site to

see and discuss their processes and the supply requirements that these pose. However, a small minority of suppliers responds to such invitations. Most suppliers were, according to the Chairman, focusing on the order and were not adopting a longer-term view which would require a greater knowledge of the customers' processes and product use.

Company-wide involvement of employees in understanding and managing customer needs and requirements supports a definition of customer service that extends beyond the conventional dimensions of delivery and quality performance. Findings from the semi-structured interviews show that this is not an inherent characteristic of SMMs.

6.2.3 Feedback from customers

Understanding customer needs is an important element of market orientation [Pelham and Wilson 1995, Kwaku Atuahene-Gima 1996]. It is also a major characteristic of the *service factory* [Chase and Gervin 1989] and *the service-profit chain* [Heskett et al. 1994]. Direct involvement of customers in product development as a means to collect information on market needs is a strategy particularly applicable in small and medium sized firms for which market research studies are often too costly [Karlsson and Ahlstrom 1997, Brooksbank et al. 1992]. Leuthesser and Kohli [1995] defined *initiating behaviour* as the extent to which a supplier proactively initiates efforts to better understand a buyer's needs and requirements. They found initiating behaviour to be positively associated with buyer satisfaction.

How do companies interviewed go about understanding customer needs? Company F employ 8 sales engineers who work with customers to develop a solution before the sale. These individual solutions are often the basis of idea generation for new products that respond to perceived market opportunities. After sale, sales engineers make follow-up visits to customers to obtain feedback on product design, performance and desired features. These are discussed in monthly meetings in the company. Company H have three sources of information for new product

development: their own design department, customer feedback, and feedback from service engineers who service competitors' equipment.

Staying with the customer before, during, and after the sale appears to be a strategy particularly suitable for SMMs in their attempt to proactively understand individual customer needs and develop products/services that may meet needs of groups of customers effectively.

6.2.4 Total acquisition cost approach

De Rose [1991] emphasises that buying decisions are ultimately based on the least total cost in use. It is, therefore, imperative for suppliers to demonstrate that product performance, features, and characteristics as well as services accompanying the physical product offering results in the least total cost of the acquisition, ownership, and use of what the customer buys.

Interviews with purchasing personnel of a large customer in the automotive industry revealed that no standard procedures existed for requirements that proposals submitted by suppliers should meet. Some suppliers tend to provide the minimum required information when they bid for a job. Others, however, provide details of the claimed benefits of their products in use, as well as technology forecasts. Company E uses this strategy when trying to attract new customers. Similarly, Company A rely heavily on their technological strength to analyse the particular customer application, provide details on the performance characteristics of their equipment, and the savings possible for their customers accruing from the use of their equipment.

Adopting a total acquisition cost approach aims at satisfying the rational component of the criteria that customers base their buying decisions upon. Satisfying this component involves helping buyers make more informed decisions about their buying needs. Findings from the semi-structured interviews suggest that some SMMs make systematic efforts to differentiate themselves from competitors by influencing their customers' buying decisions.

6.2.5 Computer links with customers

Information technology has been suggested as an important coordinating mechanism across organisations [Bensaou and Venkatraman 1994]. Information technology allows the timely and accurate transmission of information across the supply chain [Christopher 1992, Lamming 1993, La Londe and Masters 1994, Stump and Sriram 1997]. In the sample of SMMs that were interviewed, a limited use of information technology in communicating with customers was identified. Company D were planning the electronic exchange of drawings with customers in order to reduce design and development times and minimise errors. Company J had implemented a new computer system that would allow for easier monitoring of customer order status.

While information technology and its applications in facilitating supplier-customer cooperation have received considerable attention in the literature, implementation in an SMM context is not obvious. Findings from the semi-structured interviews suggest that application of information technology is considered only after strong, cooperative relationships have already developed.

The discussion so far has revolved around the service aspect of the SMM's offering. Following Cespedes [1995], an effort was made to deal with dimensions of customer service that extend beyond conventional notions of delivery and quality performance. Fundamental issues of business definition as well as aspects of the day-to-day management of customer relationships were identified, relevant concepts from the literature were discussed and findings from the semi-structured interviews were used to provide insight into how these concepts might materialise in an SMM context through specific activities. These activities form the SMM's response to customer needs. Response to expressed customer requirements on the other hand presents the need to take into account additional aspects of the supplier's offering.

6.3 Performance relative to competition

A substantial part of the SMM's response to customer requirements refers, of course, to its performance against these requirements. Empirical studies described in Chapter 3 [Turnbull et al. 1993, Waters-Fuller 1996] suggest that quality and delivery reliability are increasingly becoming "order qualifiers". There are no clear suggestions in the literature with regard to the effect of price competitiveness in relation to other criteria used by customers for supplier selection. Voss et al. [1998] investigated a wide range of performance dimensions including quality, on-time delivery, lead time, product customisation, and price. They found top performing companies in their sample achieving higher levels of customer satisfaction. Some of the SMMs interviewed were explicit in stating that they were trying to keep to market prices and were very cautious not to damage long-term relationships with customers for a short-term benefit of charging higher prices. Some of the SMMs interviewed saw their advantage in relation to competition in terms of shorter customer lead times, shorter design time, lower cost and shorter time of product servicing, or ability to meet specific customer requirements. Pettitt [1992] found that, regardless of other factors, small firms were expected to show a certain degree of preparedness and performance in order to be considered for getting a job.

Turnbull and Cunningham [1981] analysed the attitudes and experiences of over 400 buyers of industrial goods in Europe to find that supply performance capability and price competitiveness were integral parts of supplier assessment relative to competitors, along with factors such as technological expertise and customer orientation.

The above studies indicate that existing and potential customers assess their suppliers across a range of performance dimensions including quality, delivery, lead time, ability to meet specific customer requirements, and price. The SMM's performance across these dimensions relative to competition forms part of the customers' supplier selection processes.

6.4 Marketing communication tools

In discussing the relative effectiveness of various marketing tools, Bonoma [1984] suggests that a sales force is an excellent tool for keeping customers through selling and account servicing and a poor tool for getting new customers because of the high cost per contact. This appears to be especially true for SMMs. Advertisements, brochures, and the like are good customer-getting tools and also help with image maintenance, but they are usually ineffective in persuading customers to keep coming back, except in the case of low-priced, and simple products. Sales promotions can serve for both getting and keeping customers, depending on the industry. In contrast with such specific and targeted marketing communication tools, trade shows can meet a broader range of different objectives simultaneously [Bonoma 1984]. Trade shows are a valuable way of making contact with potential buyers and act as a forum to bring together people of influence [Paterson 1984].

Eassom et al. [1998] found that older, more mature companies had a marketing philosophy of customer retention. These companies were not actively advertising their services and relied primarily on word of mouth to expand their customer base. On the contrary, younger companies were more proactive and were interested in expanding their customer base.

SMMs interviewed use a variety of marketing communication tools. These include: direct mail, phone calls, advertisement in trade journals, top management involvement, personal sales calls, trade shows, and some were greatly relying on word of mouth. One SMM was concerned about the increasing use of the Internet by its competitors and wanted to know more about the effectiveness of this particular medium in an SMM context.

A variety of marketing communication tools is used by SMMs in their efforts to attract new customers and keep existing ones. The effectiveness of most of these tools appears to be contingent on the objective at hand, that is, customer retention or

customer base expansion, as they offer different degrees of customer contact in terms of breadth and depth.

6.5 Nature of customer relationships

The literature review identified inter-organisational relationships as complex, multidimensional phenomena. Real inter-organisational relationships are usually hybrids of the theoretically derived forms that attempt to arrange them along a continuum ranging from adversarial to fully cooperative. Furthermore, industry norms play an important role in defining the nature of relationships: practices that in one industry may seem extremely cooperative, in a different industry may simply represent the way of doing business [Anderson and Narus 1991]. The above pose particular problems in the attempt of this study to define what is meant by “good working relationships” in a cross-industry context and from an SMM perspective.

In order to conceptualise such a relationship, this study used findings from the literature review and the interviews with SMMs. It identified the following critical dimensions of the supplier-customer relationship: the strength of the relationships, the fairness of the relationships, the size of the customer base and the degree of dependence of the SMM on a few customers. These are dimensions which, as suggested in Chapters 2 and 3, do not necessarily covary.

From the set of dimensions listed above, relationship strength and fairness are concepts which can invite (and, indeed, do invite as the literature suggests) different interpretations. Therefore, there is a need to employ operational measures that will provide objective, and observable in practice, indicators for these concepts. The following describes how this study measures relationship strength and fairness.

6.5.1 Measuring relationship strength

A major consideration in describing industrial relationships is their time orientation. Empirical findings presented in Chapter 3 show that industrial relationships are

generally long-term. This limits the ability of this indicator to discriminate among types of relationships. On the other hand, the absence of long-term agreements has been criticised for causing unwillingness or reluctance to the supplier to invest in the relationship [De Toni and Nassimbeni 1995, Pettitt 1992]. The existence of long-term contracts has been acknowledged as a critical dimension of the supplier-customer relationship and is frequently used as an indicator of the quality of the relationship [e.g., Helper and Sako 1995, Waters-Fuller 1996].

The central task in developing and maintaining relationships, and particularly close relationships, is information exchange [Stuart and McCutcheon 1996]. The literature review in Chapters 2 and 3 explicitly described the problems in communication and information exchange encountered by SMMs. Previous research has used a variety of indicators to measure information exchange in inter-organisational relationships, such as multiplicity of contacts [Bensaou 1993, IMP 1982], and frequency of contacts [IMP 1982]. These measures have been used to measure information exchange in one-to-one relationships.

Cunningham and Homse [1986] investigated interpersonal contacts between 49 British suppliers of industrial goods and their major customers in France, Germany, Italy, Sweden and the UK. They found that interface contacts in industrial markets between suppliers and customers rarely take the form of simple dyadic relationships between salesman and buyer or, indeed, of salesmen's face-to-face meetings with different members of the customer's Decision Making Unit (DMU). Several people from different functional departments in supplier companies are involved in a network of contacts with their counterparts in the customer firm and this embraces multiple levels in the organisational hierarchy. These contacts develop into a variety of extremely complex patterns as the stages of a supplier-customer relationship evolve over time.

In terms of multiplicity and levels of contacts, no clear patterns emerged from the interviews. Multiplicity of contacts is certainly a function of the complexity of the

product exchanged. For example, in Company G, contacts with customers take place among several functions from both organisations. In the case of the particular company, this does not necessarily suggest cooperation: a lot of time is spent in resolving reoccurring disagreements on part specifications [see section 5.10]. Company I also have contacts in their customer organisations. At the same time, however, they point to the problem of conflicting and uncoordinated, as they perceive them, demands from different customer departments. The same holds true for the frequency of contacts. Cunningham and Homse [1986] suggest that quantity does not necessarily imply quality and that research has shown that the frequency of contacts is inversely related to the duration of contacts.

It was further found during the interviews that the above indicators are particularly unsuitable for the unit of analysis of this study -- that is, relationships between the SMM and its customer base. At the same time, however, the interviews pointed to the "time consciousness" of managers in SMMs. Managers in smaller firms are faced with a diversity of strategic and operational tasks [Karlsson 1997], which creates a pressing environment. This may be an additional reason for their "time consciousness". In any case, managers interviewed showed a particular concern about the nature of the tasks that absorb their time in dealing with customers, their problems in communicating with them, the chances of acceptance of their suggestions for improvements, and their ability to influence customer decisions that affect their operations.

The time dimension and the clear distinction between coordinating and control or firefighting tasks made by SMMs, indicated that the measure employed by Bensaou and Venkatraman [1993], (that is, the proportion of time spent in control vs. coordination tasks), could provide an indication of the degree of coordination that characterises the SMM's customer relationships.

Bensaou and Venkatraman [1993] suggest that tasks within a relationship can basically be classified into two groups -- control and coordination tasks. Control tasks

include negotiating prices, monitoring performance, resolving very urgent problems. Coordination tasks, on the other hand, include coordinating for continuous improvements, exchanging ideas and future plans and keeping in touch with the customer. In the Bensaou and Venkatraman study, the unit of analysis was the one-to-one relationship. Based on study findings from the interviews, it appears that the above classification could be used as a measure of the degree of coordination that collectively characterises the relationships of the SMM with its major customers.

6.5.2 Measuring relationship fairness

Another critical aspect of supplier-customer relationships refers to the sharing of risks and benefits between parties involved in the relationship. Sharing of risks and benefits is directly related to the existence of an imbalance of power and its potential use from the most powerful party to dictate the terms of the relationship. Typologies of relationships proposed in the literature [e.g., Campbell 1985, Heide 1994] make explicit reference to this type of relationship. Empirical studies [Holmlund and Kock 1996, Waters-Fuller 1996] have suggested that suppliers might experience delivery terms that are dictated by customers and lead to increased costs for suppliers or inability to satisfy the demands of other customers. At Company I, the customer agreed to finance the inventory that would be kept for the particular customer after it was made clear that the lead time required by the customer was not feasible.

Prompt payment from customers can be a problem for small suppliers. They usually lack the power to insist on collecting debts without facing the threat of damaging their customer relationships [Terazono 1999, Chittenden and Bragg 1998]. On the other hand, customers should realise that late payments have a knock-on effect on the whole supply chain, beyond their immediate suppliers [Chittenden and Bragg 1998, Management Accounting 1998].

Lack of coordination of delivery and production schedules is often blamed in the literature for excessive costs and poor delivery performance in supply chains [Stalk

and Hout 1990, Lee et al. 1997]. Forrester [1961] showed how decisions at various levels in a supply chain can cause distortion of the real demand as one moves up the supply chain. Empirical studies have identified the fact that many suppliers encounter problems with frequent customer-initiated changes in delivery schedules [Waters-Fuller 1996, Harrison 1995, Webster et al. 1998].

Many of the SMMs interviewed were experiencing such problems. Company J, for example, consider response to schedule instability as part of the service they offered to customers. Company C, on the other hand, had their major customer providing very reliable schedules, whereas for the rest of customers, schedule instability was so severe that measurement of delivery performance was becoming meaningless. In a similar fashion, Company E were experiencing high schedule instability and they had pointed out to the customers the lack of coordination as the cause of it. Nevertheless, no corrective action was taken. Company E attributed this to the fact that they had to deal with low level personnel in the customer organisation. As a result, they have limited influence in customer decisions that directly affect their operations, primarily with customer ordering patterns.

Based on these findings, it was determined that the indicators of:

- the time elapsed from goods delivery to customer to payment from customer
- the extent to which delivery terms are determined through negotiations with the customer
- the extent to which delivery schedule changes occur after the start of production

would be appropriate indicators of the fairness in the supplier-customer relationship.

Chapters 2 and 3 have documented the complexity and multidimensionality of supplier-customer relationships. Relationship strength and fairness were identified as critical dimensions of the nature of supplier-customer relationships. Despite their criticality, their measurement is difficult. This study used the literature review and

findings from the semi-structured interviews with SMMs to develop measures believed to be objective and applicable to an SMM context.

6.6 Links between relationship management activities of the SMM and the nature of customer relationships

This section provides the theoretical background that will be used as a basis for the development of the research hypotheses with regard to the links between relationship management activities employed by SMMs and the nature of their relationships with customers. Exhibit 6.1 shows the major links that the study aims to investigate.

Section 6.5 discussed the operationalisation of the concepts of relationship strength and fairness. Following this operationalisation scheme, research hypotheses involving these two concepts are respectively broken down into sets of testable sub-hypotheses. These sub-hypotheses then, refer to the individual indicators used to describe each concept -- that is, contracts and coordination for relationship strength, and negotiated delivery policies, customer schedule stability, and delivery-to-payment cycles for relationship fairness.

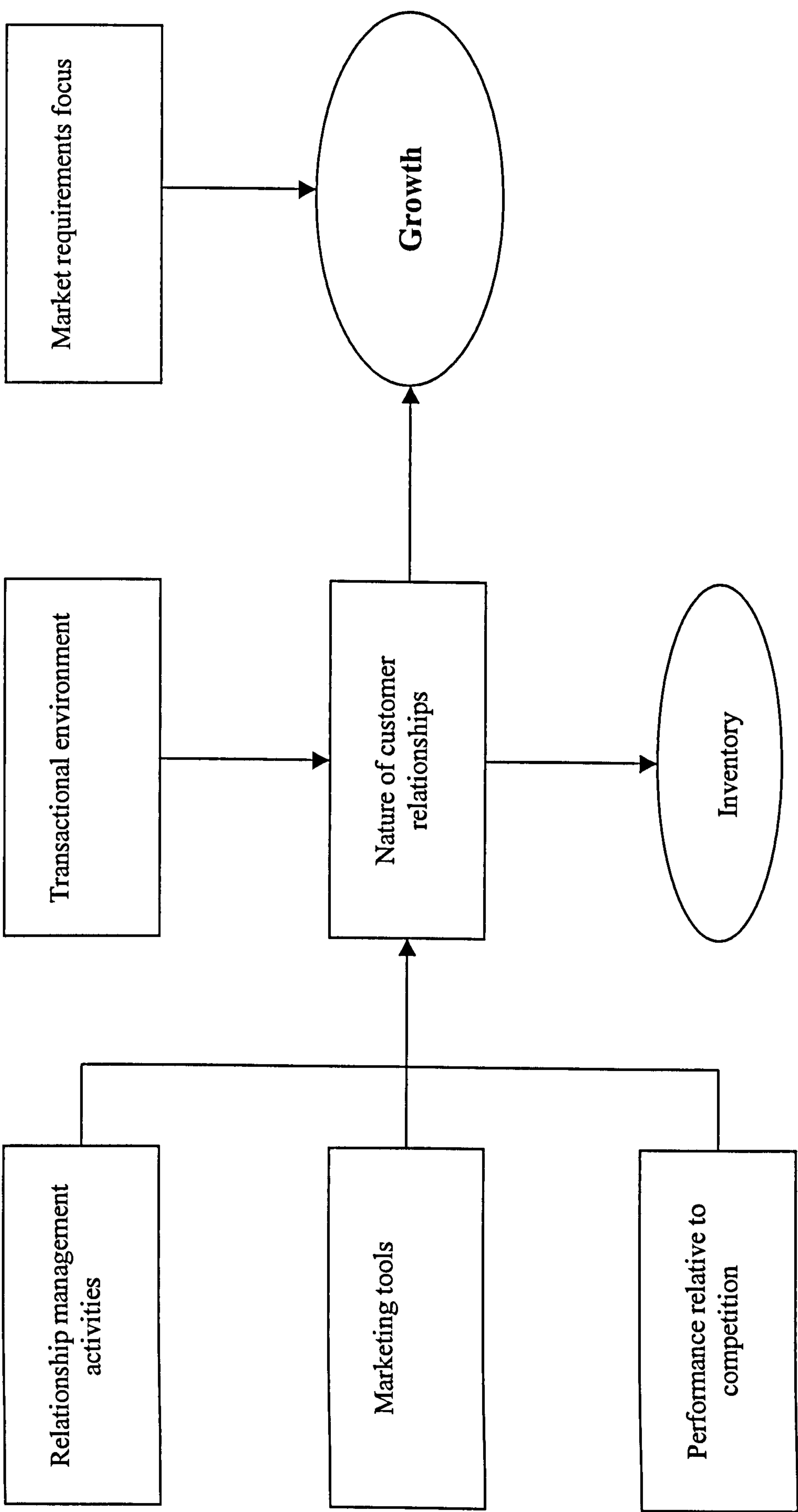
All hypotheses stated in the following sections are given in the alternative form.

6.6.1 Responding to customers' uncertainty about their own needs and the nature of customer relationships

Hakansson et al. [1997] posit that high need uncertainty will lead buyers to place greater importance to functional and quality aspects rather than price, exhibit high source loyalty, and engage in more frequent and multifunctional contacts with suppliers. Frazier et al. [1988] consider product importance to the buyer as a condition favouring the development of cooperative relationships. Shapiro [1991] suggests that transfer of technology is a major reason for the formation of strategic partnerships.

Exhibit 6.1

Links between relationship management activities, nature of customer relationships, inventory and SMM growth



Empirical evidence suggests that product customisation favours the development of close relationships [Bensaou and Venkatraman 1993 and 1996]. There is evidence to suggest that customers may attribute great importance to supplier expertise [Helper and Sako 1995, Turnbull et al. 1993, De Toni and Nassimbeni 1996, Pettitt 1992] and that suppliers who offer expertise might be more likely candidates for cooperative relationships [Sako et al. 1994, Helper and Sako 1995]. Product customisation, and product education and training have been found, among others, to be positively associated with successful commercialisation of high-tech process innovations. There is also, however, evidence to suggest that under conditions of high market uncertainty (measured by the market familiarity, understanding of customer needs and ability to translate customer needs into products), small firms should be especially cautious about tailoring the product to individual customers and that they should avoid introducing products that are important purchases for the customers [Yap and Souder 1994]. In general, the services that manufacturing companies, and especially SMMs, can offer to their customers have received little attention. The case studies that were found in the literature refer to larger companies [Comer and Zirger 1997, Voss 1992], while larger empirical studies focus either on specific business situations such as new product introduction of process innovations [Athaide et al. 1996], or specific industries such as the pharmaceutical industry [Szeinbach et al. 1997].

As discussed in Section 6.2.1, the actual product/service itself can evolve in a vertical sense by combining products and/or processes that assume additional/complementary functions previously performed by the customer, other suppliers, or individual earlier products. The increase of own share of value added in the supply chain has been suggested as a strategic choice that can reinforce the position of the SMM in the supply chain and make its substitution more difficult [Bhattacharya et al. 1995]. Still, no empirical evidence exists on the effect of such choice on the nature of customer relationships.

In the sample of SMMs that were visited, Company J believe that the services they provide to customers allow them to develop a range of interpersonal contacts with

personnel at high levels of the customer's organisational hierarchy which, in turn, allow them to influence decisions taken in the customer organisation about the relationship with Company J. On the other hand, Company E, who have not developed a vertical focus in terms of their product/service offering, identify one of their major problems in dealing with customers as the fact that they have to deal with low level personnel in the customer organisation. As a result, they have limited influence in customer decisions that directly affect their operations, primarily with customer ordering patterns.

Based on the above, it is hypothesised that:

Hypothesis 1

Responding to customers' uncertainty about their own needs is positively associated with stronger working relationships with customers

Hypothesis 1 is decomposed into the following testable sub-hypotheses:

Hypothesis 1a

Responding to customers' uncertainty about their own needs is positively associated with a higher proportion of long-term contracts

Hypothesis 1b

Responding to customers' uncertainty about their own needs is positively associated with relationships with major customers that are more coordinative

Hypothesis 2

Responding to customers' uncertainty about their own needs is positively associated with fairer relationships with customers

Hypothesis 2 is decomposed to the following testable sub-hypotheses

Hypothesis 2a

Responding to customers' uncertainty about their own needs is positively associated with higher frequency of determining delivery policies through negotiation.

Hypothesis 2b

Responding to customers' uncertainty about their own needs is positively associated with lower frequency of customer schedule changes after the start of production

Hypothesis 2c

Responding to customers' uncertainty about their own needs is positively associated with shorter delivery-to-payment cycles.

Hypothesis 3

The share of value added in the supply chain is positively associated with stronger working relationships with customers

Hypothesis 3 is decomposed into the following testable sub-hypotheses:

Hypothesis 3a

The higher the share of value added in the supply chain, the higher the proportion of long-term contracts

Hypothesis 3b

The higher the share of value added in the supply chain, the more coordinative the relationships with major customers

Hypothesis 4

The share of value added in the supply chain is positively associated with fairer relationships with customers

Hypothesis 4 is decomposed into the following testable sub-hypotheses:

Hypothesis 4a

The higher the share of value added in the supply chain, the higher the frequency of determining delivery policies through negotiation.

Hypothesis 4b

The higher the share of value added in the supply chain, the lower the frequency of customer schedule changes after the start of production.

Hypothesis 4c

The higher the share of value added in the supply chain, the shorter the delivery-to-payment cycle.

6.6.2 Total acquisition cost approach and the nature of customer relationships

Ellram and Hendrick [1995] found that both suppliers and customers agree that their partnership relationship considers total cost of ownership more than price. The buyers consider total cost of ownership to be more influential in their supplier selection decisions than the suppliers, from their perspective, do.

Interviews conducted in this study revealed that suppliers who adopt such an approach, believe that they provide buyers with the opportunity to educate themselves on technical and market issues for the specific product, and suppliers themselves have a greater chance of getting the job.

It is therefore, hypothesised that:

Hypothesis 5

The adoption of a total acquisition cost approach is positively associated with stronger working relationships with customers.

Hypothesis 5 is decomposed in the following testable sub-hypotheses:

Hypothesis 5a

The adoption of a total acquisition cost approach is positively associated with the proportion of long-term contracts.

Hypothesis 5b

The adoption of a total acquisition cost approach is positively associated with relationships with major customers that are more coordinative

Hypothesis 6

The adoption of a total acquisition cost approach is positively associated with fairer relationships with customers

Hypothesis 6 is decomposed into the following testable sub-hypotheses

Hypothesis 6a

The adoption of a total acquisition cost approach is positively associated with higher frequency of determining delivery policies through negotiation.

Hypothesis 6b

The adoption of a total acquisition cost approach is positively associated with lower frequency of customer schedule changes after the start of production

Hypothesis 6c

The adoption of a total acquisition cost approach is positively associated with shorter delivery-to-payment cycles.

It is also reasonable to expect that SMMs who have adopted a strategy of responding to customers' uncertainty about their own needs will be more inclined to demonstrate a high problem-solving ability and therefore they will more likely adopt a total

acquisition cost approach when trying to get the business of a customer. It is therefore hypothesised that:

Hypothesis 7

Responding to customers' uncertainty about their own needs is positively associated with the adoption of a total acquisition cost approach.

6.6.3 Feedback from customers and the nature of customer relationships

Athaide et al. [1996] found information gathering on product performance to be an important factor in successful commercialisation of high-tech product innovations.

Leuthesser and Kohli [1995] defined initiating behaviour as the extent to which a supplier proactively initiates efforts to better understand a buyer's needs and requirements. They found initiating behaviour to be positively associated with buyer satisfaction.

Stuart et al. [1995] suggest that feedback from customer to supplier facilitates the development of close relationships. Even feedback systems that focus strictly on delivery performance and service quality can give the supplier useful details on how delivery systems need to be improved. More comprehensive feedback systems which include not only assessments of delivery but also of product serviceability and features can be even more useful. Krause and Ellram [1995] found formal and informal supplier evaluation and feedback of evaluation results to be important elements of cooperative supplier development programs implemented by customers.

It is, therefore, hypothesised that:

Hypothesis 8

Getting feedback from customers is positively associated with stronger working relationships with customers.

Hypothesis 8 is decomposed into the following testable sub-hypotheses:

Hypothesis 8a

Getting feedback from customers is positively associated with the proportion of long-term contracts.

Hypothesis 8b

Getting feedback from customers is positively associated with relationships with customers that are more coordinative

Hypothesis 9

Getting feedback from customers is positively associated with fairer relationships with customers

Hypothesis 9 is decomposed into the following testable sub-hypotheses:

Hypothesis 9a

Getting feedback from customers is positively associated with higher frequency of determining delivery policies through negotiation.

Hypothesis 9b

Getting feedback from customers is positively associated with lower frequency of customer schedule changes after the start of production.

Hypothesis 9c

Getting feedback from customers is positively associated with shorter delivery-to-payment cycles.

It is also reasonable to assume that a context characterised by the adoption of a strategy for responding to customers' uncertainty about their own needs will be more conducive to getting feedback from customers.

It is therefore hypothesised that:

Hypothesis 10

Responding to customers' uncertainty about their own needs is positively associated with getting feedback from customers.

6.6.4 Devolution of supply chain responsibility to the shop floor and the nature of customer relationships

Ellram and Hendrick [1995] found that the ability of the supplier to understand the use by the customer of its product and the mutual understanding of each others' processes are valued as characteristics of cooperative relationships by both customers and suppliers. SMEs who pay more attention to customer relationships have achieved superior customer satisfaction [Voss et al. 1998].

As a manifestation of their customer focus, Company I implemented a pilot scheme regarding the devolution of responsibility for customer order management to the shop floor. Its success has encouraged management to consider its extension to all customer orders.

It is therefore, hypothesised that:

Hypothesis 11

Devolution of supply chain responsibility to the shop floor is positively associated with stronger working relationships with customers

Hypothesis 11 is decomposed in the following testable sub-hypotheses:

Hypothesis 11a

Devolution of supply chain responsibility to the shop floor is positively associated with higher proportion of long-term contracts

Hypothesis 11b

The higher the devolution of supply chain responsibility to the shop floor, the more coordinative the relationships with major customers.

Hypothesis 12

Devolution of supply chain responsibility to the shop floor is positively associated with fairer relationships with customers

Hypothesis 12 is decomposed into the following testable sub-hypotheses:

Hypothesis 12a

Devolution of supply chain responsibility to the shop floor is positively associated with higher frequency of determining delivery policies through negotiation

Hypothesis 12b

Devolution of supply chain responsibility to the shop floor is positively associated with lower frequency of delivery schedule changes after the start of production

Hypothesis 12c

Devolution of supply chain responsibility to the shop floor is positively associated with shorter delivery-to-payment cycles.

6.6.5 Computer links with customers and the nature of customer relationships

The review of empirical studies in chapter 3 provided mixed results with regard to the effect of the use of information technology on the nature of customer relationships. Bensaou and Venkatraman [1995] examined the role of information technology in fostering supplier-customer cooperation in the automotive industry. They found that EDI as a coordination technology supports cooperation across organisations. It was also related to the degree of quasi-integration measured by the percent of total volume sourced by a particular supplier [Bensaou and Venkatraman 1995]. The authors

identified a heavy use of information technology in engineering, purchasing, production scheduling in relationships involving the exchange of highly customised components or integrated subsystems requiring high levels of technology and engineering. They, however, also identified a heavy use of information technology, in the purchasing function in particular, for the exchange of standardised components characterised by predictable demand.

Wang and Seidmann [1995] suggested that as customers increasingly invest in information technology, suppliers who make reciprocal investments have the potential to gain a greater share of the buyers' requirements, if not sole sourcing agreements, on the basis of cost advantages over nonadopting competitors.

Stump and Sriram [1997] focused on the use of information technology as a coordinating mechanism in the purchasing function. Their findings suggest that the use of information technology was positively associated with closer relationships. Ellram and Hendrick [1995] on the other hand, found that the use of information technology was not a major element in close, collaborative buyer-supplier relationships.

It is therefore hypothesised that:

Hypothesis 13

The use of computer links with customers is positively associated with stronger working relationships with customers

Hypothesis 13 is analytically decomposed into the following testable sub-hypotheses:

Hypothesis 13a

The higher the extent of computer links with customers, the higher the proportion of long-term contracts

Hypothesis 13b

The higher the extent of computer links with customers, the more coordinative the relationships with major customers

Hypothesis 14

The higher the use of computer links with customers, the fairer the relationships with customers

Hypothesis 14 is decomposed into the following testable sub-hypotheses:

Hypothesis 14a

The higher the use of computer links with customers, the higher the frequency of determining delivery policies through negotiation

Hypothesis 14b

The higher the use of computer links with customers, the lower the frequency of delivery schedule changes after the start of production

Hypothesis 14c

The higher the use of computer links with customers, the shorter the delivery –to-payment cycle

6.6.6 Performance relative to competition and the nature of customer relationships

As suggested in Section 6.3, supplier performance is expected to have an effect on the nature of customer relationships regardless of the relationship management activities that the SMM may undertake.

It is therefore hypothesised that:

Hypothesis 13b

The higher the extent of computer links with customers, the more coordinative the relationships with major customers

Hypothesis 14

The higher the use of computer links with customers, the fairer the relationships with customers

Hypothesis 14 is decomposed into the following testable sub-hypotheses:

Hypothesis 14a

The higher the use of computer links with customers, the higher the frequency of determining delivery policies through negotiation

Hypothesis 14b

The higher the use of computer links with customers, the lower the frequency of delivery schedule changes after the start of production

Hypothesis 14c

The higher the use of computer links with customers, the shorter the delivery –to- payment cycle

6.6.6 Performance relative to competition and the nature of customer relationships

As suggested in Section 6.3, supplier performance is expected to have an effect on the nature of customer relationships regardless of the relationship management activities that the SMM may undertake.

It is therefore hypothesised that:

Hypothesis 15

The higher the SMM's performance relative to competition, the better the working relationships with customers

Hypothesis 15 is decomposed in the following testable sub-hypotheses:

Hypothesis 15a

The higher the SMM's performance relative to competition, the higher the proportion of long-term contracts

Hypothesis 15b

The higher the SMM's performance relative to competition, the more coordinative the relationships with major customers

Hypothesis 16

The higher the SMM's performance relative to competition, the fairer the relationships with customers

Hypothesis 16 is decomposed into the following testable sub-hypotheses:

Hypothesis 16a

The higher the SMM's performance relative to competition, the higher the frequency of determining delivery policies through negotiation

Hypothesis 16b

The higher the SMM's performance relative to competition, the lower the frequency of customer schedule changes after the start of production

Hypothesis 16c

The higher the SMM's performance relative to competition, the shorter the delivery-to-payment cycle.

Hypothesis 17

The higher the SMM's performance relative to competition, the larger the customer base

6.6.7 Marketing communication tools and the nature of customer relationships

The discussion on marketing communication tools in Section 6.1.6 suggests that there is very limited evidence in the literature about the relative effectiveness of different marketing communication tools in an SMM context. In order to test for the effect of these tools on the ability of the SMM to expand its customer base, it is hypothesised that:

Hypothesis 18

The greater the use of marketing communication tools, the larger the SMM's customer base

Hypothesis 18 is decomposed into the following testable sub-hypotheses:

Hypothesis 18a

The greater the use of direct mail and phone calls to customers, the larger the SMM's customer base

Hypothesis 18b

The greater the use of advertisements in trade journals and trade shows, the larger the SMM's customer base

Hypothesis 18c

The greater the use of personal sales calls, the larger the SMM's customer base

Hypothesis 18d

The greater the top management involvement in getting new customers, the larger the SMM's customer base

Hypothesis 18e

The greater the use of the Internet for getting new customers, the larger the SMM's customer base.

Hypothesis 18f

The greater the reliance on word of mouth, the smaller the SMM's customer base

Close relationships with customers require heavy commitment of resources [Shapiro 1991]. Especially in an SMM context, these may be particularly scarce. As discussed in Section 3.9.1 researchers have viewed large customer bases as contradictory to the concept of partnerships and its implications for increased provision of services and expertise, and increased delegation of responsibilities from customers to suppliers.

Hypothesis 19

The adoption of a strategy of responding to customers' uncertainty about their own needs is positively associated with a smaller customer base.

Hypothesis 20

The greater the share of value added in the supply chain, the smaller the customer base.

Hypothesis 21

The larger the proportion of long-term contracts, the smaller the customer base.

Studies have shown that smaller companies tend to depend on fewer customers [see Section 3.9.1]. It is likely that a small customer base may be associated with higher levels of dependence. On the other hand, it may be the case that a company chooses to

develop a balanced portfolio of customer relationships by avoiding excessive dependence on any trading partner [Krapfel et al. 1991]. Indeed, this was the case of one of the companies visited during the semi-structured interviews with SMMs. Over the last few years, Company J had reduced their customer base and, at the same time, set upper limits of sales volumes that each customer would account for.

It is hypothesised that:

Hypothesis 22

A larger customer base is positively associated with lower dependence on a few customers

6.7 The nature of customer relationships, inventory and growth

As shown in Chapters 2 and 3, studies of the relationships between the nature of customer relationships, inventory performance and growth have provided mixed results. This review has already reported findings about the unequal sharing of benefits in favour of customers, the mixed (at best) performance of suppliers in voice relationships, and the increased administrative and stockholding burdens for JIT suppliers. At the same time, other studies have suggested that closer communication with customers and a cooperative orientation are associated with lower inventories for suppliers [Lieberman 1999]. The length of contracts, and generally of the relationships, has not been found to be associated with lower inventories. In terms of growth, empirical findings do not point to the direction of greater growth through closer relationships.

Kalwani and Narayandas [1995] defined a long-term relationship as one where the supplier firm has made a substantial portion of its sales to the same customer(s) over a 6-year period. Their findings suggest that suppliers in long-term relationships achieve the same level of growth as firms that employ a transactional approach to servicing their customers. Studies of UK SMEs have shown positive associations between increasing customer base and achieving growth [Smallbone et al. 1992] and between

large customer base and total employment [Birley and Westhead 1990]. On the other hand, Bozarth and Edwards [1997] consider a large customer base as an indicator of the lack of market requirements focus with negative effect on performance.

It is therefore hypothesised that:

Hypothesis 23

The stronger the relationships with major customers, the higher the growth of the SMM

Hypothesis 23 is decomposed into the following testable sub-hypotheses:

Hypothesis 23a

The higher the proportion of long-term contracts, the higher the growth of the SMM

Hypothesis 23b

The more coordinative the relationships with major customers, the higher the growth of the SMM

Hypothesis 24

The larger the customer base, the higher the growth of the SMM

Hypothesis 25

The fairer the relationships with customers, the higher the growth of the SMM

Hypothesis 25 is analytically decomposed into the following sub-hypotheses:

Hypothesis 25a

The higher the stability of customer schedules, the higher the growth of the SMM

Hypothesis 25b

The higher the joint determination of delivery policies with customers, the higher the growth of the SMM

Hypothesis 25c

The shorter the delivery-to-payment cycle, the higher the growth of the SMM

Hypothesis 26

The stronger the relationships with customers, the better the inventory performance of the SMM.

Hypothesis 26 is decomposed into the following testable sub-hypotheses:

Hypothesis 26a

The higher the proportion of long-term contracts, the better the inventory performance of the SMM.

Hypothesis 26b

The more coordinative the relationships with customers, the better the inventory performance of the SMM

Hypothesis 27

The fairer the relationships with customers, the better the inventory performance of the SMM.

Hypothesis 27 is analytically decomposed into the following sub-hypotheses:

Hypothesis 27a

The higher the stability of customer schedules, the better the inventory performance of the SMM

Hypothesis 27b

The higher the joint determination of delivery policies with customers, the better the inventory performance of the SMM

6.8 Market requirements focus and growth

As suggested in Chapter 3, there is extremely limited empirical evidence on the effect of the existence, or the lack of, market requirements focus on the performance of small firms. This evidence suggests that diffusion of the firm's resources into serving diverse customer requirements has a negative effect on performance [Pelham and Wilson 1995] and not only for small firms [Bozarth and Edwards 1997].

Market requirements focus is evident in some of the SMMs interviewed. Company J concentrates on specific volume ranges and product characteristics and all customer enquiries are reviewed as to whether they fall directly within the production capabilities of the company. Production is organised into cells wherever possible. Company G specialises in the manufacture of a specific type of component in terms of its functional and dimensional specifications and the production batch size that determine the economics of production. The shop floor is organised into dedicated production lines. Similarly, Company F turns down business which falls outside the well-defined capabilities of the company.

The experience of Company C adds another dimension: lack of appropriate skills in the workforce leads to problems when changes in products are introduced to the shop floor.

It is hypothesised therefore that:

Hypothesis 28

The higher the market requirements focus, the higher the growth of the SMM.

This hypothesis is decomposed into the following testable sub-hypotheses:

Hypothesis 28a

The higher the frequency of product changes, the lower the growth of the SMM

Hypothesis 28b

The more structured the customer requirements that the SMM's production system responds to, the higher the growth of the SMM.

6.9 Extraneous factors affecting the nature of customer relationships

Hypotheses 1 to 9 describe the hypothesised influences of relationship management activities on the nature of customer relationships. There are however, a number of other factors that may have an influence. Based on the literature and the discussions with SMMs a group of these potentially influencing factors were identified, namely the absolute SMM size, the geographical distance from customers, the number of competitors, the relative customers' size, the relative competitors' size, and the size of customer requirements.

Long-term contracts represent a significant commitment from both customers and suppliers. Given the high death rates in the SME sector, the absolute size of the SMM may actually act as a form of assurance to the customer regarding the viability of the supplier and the continuity of supply. Anecdotal information suggests that, at least in some industries, size is directly related to the undertaking of specific positions and roles in the supply chain [Chappell 1998]. In the sample of the companies visited, Company H systematically use their networking capabilities to outweigh their size disadvantage and establish in the eyes of the customers the image of a company who are a serious player in the healthcare business.

Geographical distance from customers may be expected to have a bearing on the nature of supplier-customer relationships. Close relationships, especially those that involve exchange of knowledge and expertise, require a great commitment of resources. Especially, in a small firm context, where top management is usually

responsible for both strategic and day-to-day management of operations, this may be particularly problematic as geographical distance from customers increases [Karlsson 1997]. As Reid and Sanders [1998] suggest, “black-box” parts suppliers and detail-controlled parts suppliers seem to need significant communication with their customers. The authors found that for these types of suppliers, North American customers tend to use North American suppliers.

Campbell’s typology of buying strategies (see Section 2.5) suggests that fragmentation of the supplier’s industry appears to favour competitive buying. Asymmetries in company size and, in particular, a size advantage on behalf of the buyer favour the selection of a competitive or a command buying strategy. Studies reviewed in Chapter 3 underlined the communication problems encountered by suppliers in dealing with their large customers (see Section 3.6). In addition, discussions with SMMs revealed that competing against larger competitors presented SMMs with significant challenges in their efforts to get and keep customers. Avoiding head-to-head competition with larger companies was found to be a characteristic of high growth small companies [Storey and Morgan 1998] whereas the ESRC study [1996] did not identify any such pattern. On the other hand, from a power balance point of view, it may be the case that customers prefer to deal with smaller companies than their larger competitors.

Johanson [1982] suggests that the customer’s production technology may have an impact on the nature of its relationship with the supplier. In particular, Johanson suggests that, due to the nature of the tasks involved, in unit and small-batch production systems relationships will be characterised by extensive, intimate, and informal contact patterns and will be long-term and cooperative in nature. He points out, however, that there are some factors which, at least partially, hinder the development of close relationships. These include the lack of regularity of the unit-production systems, sometimes with long intervals between purchases, and the project-oriented nature of the tasks which make lead time a very important factor. Findings from the interviews suggest that such forces may be in action. In the case of

Company H, for example, the selling cycle may extend to five years. Company A work on an individual order basis, despite the fact that they get repeat business from customers. A final parameter may be the existence of end-users who require that specific components or suppliers are used. In large batch and mass production systems, Johanson suggests that relationships will be more formal and more impersonal than those in unit and small-batch production systems, whereas the relationship as a whole will be characterised by a power/dependence imbalance. Relationships can be long-term and will be broken only if the supplier does not live up to his commitments.

Based on the above, the following hypotheses can be made:

Hypothesis 29

The greater the SMM's size, the higher the proportion of long-term contracts.

Hypothesis 30

The greater the geographical distance from major customers, the less coordinative the relationships with these customers

Hypothesis 31

The larger the major customers' size relative to the SMM, the less coordinative the relationships with the these customers

Hypothesis 32

The larger the major customers' size relative to the SMM, the less fair the SMM's customer relationships

Hypothesis 32 is decomposed into the following testable sub-hypotheses:

Hypothesis 32a

The larger the major customers' size relative to the SMM, the lower the frequency of determining delivery policies through negotiation

Hypothesis 32b

The larger the major customers' size relative to the SMM, the higher the frequency of customer schedule changes after the start of production

Hypothesis 32c

The larger the major customers' size relative to the SMM, the longer the delivery-to-payment-cycle.

Hypothesis 33

The larger the major competitors' size relative to the SMM, the weaker the relationships with customers

Hypothesis 33 is decomposed into the following testable sub-hypotheses:

Hypothesis 33a

The larger the major competitors' size relative to the SMM, the lower the proportion of long-term contracts

Hypothesis 33b

The larger the major competitors' size relative to the SMM, the less coordinative the relationships with major customers

Hypothesis 34

The higher the number of competitors, the weaker the customer relationships

Hypothesis 34a

The higher the number of competitors, the lower the proportion of long-term contracts

Hypothesis 34b

The higher the number of competitors, the less coordinative the relationships with major customers

Hypothesis 35

The higher the number of competitors, the less fair the customer relationships.

Hypothesis 35 is decomposed into the following testable sub-hypotheses:

Hypothesis 35a

The higher the number of competitors, the lower the frequency of determining delivery policies through negotiation

Hypothesis 35b

The higher the number of competitors, the higher the frequency of customer schedule changes after the start of production.

Hypothesis 35c

The higher the number of competitors, the longer the delivery-to-payment cycle.

Hypothesis 36

The larger the size of customer requirements, the higher the proportion of long-term contracts

Hypothesis 37

The larger the size of customer requirements, the less fair the customer relationships

Hypothesis 37 is decomposed into the following testable sub-hypotheses:

Hypothesis 37a

The larger the size of customer requirements, the higher the frequency of determining delivery policies through negotiation

Hypothesis 37b

The larger the size of customer requirements, the higher the frequency of customer schedule changes after the start of production

Hypothesis 37c

The larger the size of customer requirements, the longer the delivery-to-payment cycle.

In order to test for the effect of the study variables on customer schedule stability and inventory performance the study has to control for the type of product. It is reasonable to assume that products tailor- made to customer requirements will be more susceptible to schedule changes than standard products made without a specific customer order. It is also reasonable to assume that manufacturers of customer products will carry less inventory than manufacturers of standard products. Therefore it is hypothesised:

Hypothesis 38

Product customisation is positively associated with higher frequency of customer schedule changes after the start of production.

Hypothesis 39

Product customisation is positively associated with lower inventory holdings

Company age may play a role in the SMM's growth. According to Wijewardena and Tibbits [1999], very young firms may grow rapidly due to innovative ideas and

dynamic management, together with the fact that they are less likely to attract competition from major industry players. On the other hand, older firms may be in a better position -- by exploiting their expertise and experience -- to achieve higher growth. The study controls for the effect of company age on growth by testing the following hypothesis:

Hypothesis 40

SMM age is negatively associated with growth.

The relationships described by the hypotheses are graphically shown in Exhibit 6.2. As shown in this Exhibit, the model to be tested aims firstly to identify the combination of factors which affect critical dimensions of customer relationships. These factors include the relationship management and marketing activities employed by SMMs, as well as potentially important dimensions of the market environment in which the relationships with customers develop.

Critical dimensions of customer relationships are expected, in turn, to affect inventory performance and growth. The hypotheses aim to investigate these potential links. The hypotheses also test for the effect on growth, of another strategic element of managing customer requirements -- that is the existence or lack of market requirements focus.

A summary list of hypotheses is presented in Exhibit 6.3.

Exhibit 6.2

Model to be tested

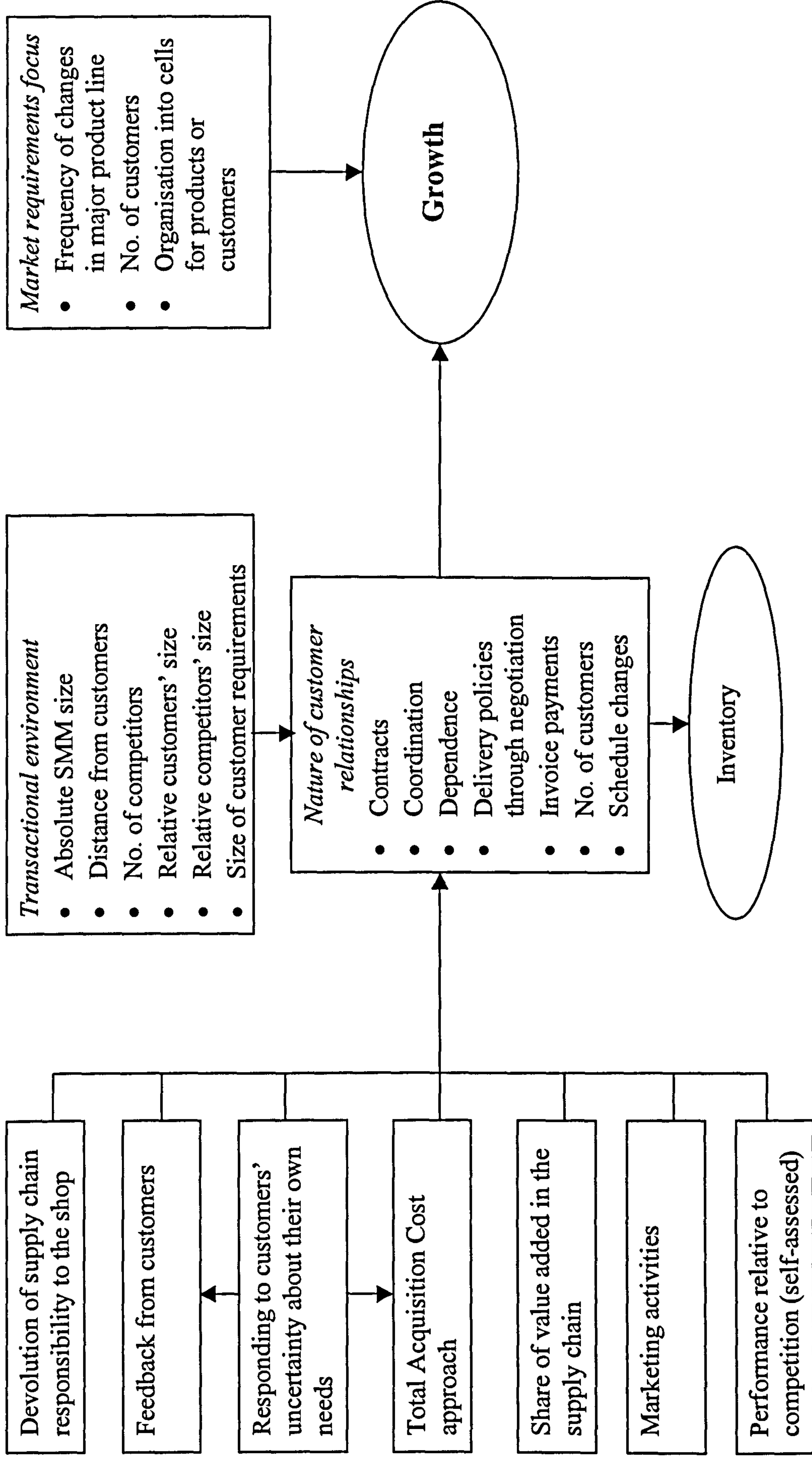


Exhibit 6.3

Summary list of research hypotheses

Hypothesis 1	Responding to customers' uncertainty about their own needs is positively associated with stronger working relationships with customers
Hypothesis 1a	Responding to customers' uncertainty about their own needs is positively associated with a higher proportion of long-term contracts
Hypothesis 1b	Responding to customers' uncertainty about their own needs is positively associated with relationships with major customers that are more coordinative
Hypothesis 2	Responding to customers' uncertainty about their own needs is positively associated with fairer relationships with customers
Hypothesis 2a	Responding to customers' uncertainty about their own needs is positively associated with higher frequency of determining delivery policies through negotiation.
Hypothesis 2b	Responding to customers' uncertainty about their own needs is positively associated with lower frequency of customer schedule changes after the start of production
Hypothesis 2c	Responding to customers' uncertainty about their own needs is positively associated with shorter delivery-to-payment cycles.

Summary list of research hypotheses (continued)

Hypothesis 3	The share of value added in the supply chain is positively associated with stronger working relationships with customers
Hypothesis 3a	The higher the share of value added in the supply chain, the higher the proportion of long-term contracts
Hypothesis 3b	The higher the share of value added in the supply chain, the more coordinative the relationships with major customers
Hypothesis 4	The share of value added in the supply chain is positively associated with fairer relationships with customers
Hypothesis 4a	The higher the share of value added in the supply chain, the higher the frequency of determining delivery policies through negotiation.
Hypothesis 4b	The higher the share of value added in the supply chain, the lower the frequency of customer schedule changes after the start of production.
Hypothesis 4c	The higher the share of value added in the supply chain, the shorter the delivery-to-payment cycle
Hypothesis 5	The adoption of a total acquisition cost approach is positively associated with stronger working relationships with customers

Summary list of research hypotheses (continued)

Hypothesis 5a	The adoption of a total acquisition cost approach is positively associated with the proportion of long-term contracts
Hypothesis 5b	The adoption of a total acquisition cost approach is positively associated with relationships with major customers that are more coordinative
Hypothesis 6	The adoption of a total acquisition cost approach is positively associated with fairer relationships with customers
Hypothesis 6a	The adoption of a total acquisition cost approach is positively associated with higher frequency of determining delivery policies through negotiation
Hypothesis 6b	The adoption of a total acquisition cost approach is positively associated with lower frequency of customer schedule changes after the start of production
Hypothesis 6c	The adoption of a total acquisition cost approach is positively associated with shorter delivery-to-payment cycle
Hypothesis 7	Responding to customers' uncertainty about their own needs is positively associated with the adoption of a total acquisition cost approach.
Hypothesis 8	Getting feedback from customers is positively associated with stronger working relationships with customers.

Summary list of research hypotheses (continued)

Hypothesis 8a	Getting feedback from customers is positively associated with the proportion of long-term contracts
Hypothesis 8b	Getting feedback from customers is positively associated with relationships with customers that are more coordinative
Hypothesis 9	Getting feedback from customers is positively associated with fairer relationships with customers
Hypothesis 9a	Getting feedback from customers is positively associated with higher frequency of determining delivery policies through negotiation.
Hypothesis 9b	Getting feedback from customers is positively associated with lower frequency of customer schedule changes after the start of production
Hypothesis 9c	Getting feedback from customers is positively associated with shorter delivery-to-payment cycles
Hypothesis 10	Responding to customers' uncertainty about their own needs is positively associated with getting feedback from customers
Hypothesis 11	Devolution of supply chain responsibility to the shop floor is positively associated with stronger working relationships with customers

Summary list of research hypotheses (continued)

Hypothesis 11a	Devolution of supply chain responsibility to the shop floor is positively associated with higher proportion of long-term contracts
Hypothesis 11b	The higher the devolution of supply chain responsibility to the shop floor, the more coordinative the relationships with major customers.
Hypothesis 12	Devolution of supply chain responsibility to the shop floor is positively associated with fairer relationships with customers
Hypothesis 12a	Devolution of supply chain responsibility to the shop floor is positively associated with higher frequency of determining delivery policies through negotiation
Hypothesis 12b	Devolution of supply chain responsibility to the shop floor is positively associated with lower frequency of delivery schedule changes after the start of production
Hypothesis 12c	Devolution of supply chain responsibility to the shop floor is positively associated with shorter delivery-to-payment cycle
Hypothesis 13	The use of computer links with customers is positively associated with stronger working relationships with customers

Summary list of research hypotheses (continued)

Hypothesis 13a	The higher the extent of computer links with customers, the higher the proportion of long-term contracts
Hypothesis 13b	The higher the extent of computer links with customers, the more coordinative the relationships with major customers
Hypothesis 14	The higher the use of computer links with customers, the fairer the relationships with customers
Hypothesis 14a	The higher the use of computer links with customers, the higher the frequency of determining delivery policies through negotiation
Hypothesis 14b	The higher the use of computer links with customers, the lower the frequency of delivery schedule changes after the start of production
Hypothesis 14c	The higher the use of computer links with customers, the shorter the delivery –to-payment cycle
Hypothesis 15	The higher the SMM’s performance relative to competition, the better the working relationships with customers

Summary list of research hypotheses (continued)

Hypothesis 15a	The higher the SMM's performance relative to competition, the higher the proportion of long-term contracts
Hypothesis 15b	The higher the SMM's performance relative to competition, the more coordinative the relationships with major customers
Hypothesis 16	The higher the SMM's performance relative to competition, the fairer the relationships with customers
Hypothesis 16a	The higher the SMM's performance relative to competition, the higher the frequency of determining delivery policies through negotiation
Hypothesis 16b	The higher the SMM's performance relative to competition, the lower the frequency of customer schedule changes after the start of production
Hypothesis 16c	The higher the SMM's performance relative to competition, the shorter the delivery-to-payment cycle
Hypothesis 17	The higher the SMM's performance relative to competition, the larger the customer base
Hypothesis 18	The greater the use of marketing communication tools, the larger the SMM's customer base

Summary list of research hypotheses (continued)

Hypothesis 18a	The greater the use of direct mail and phone calls to customers, the larger the SMM’s customer base
Hypothesis 18b	The greater the use of advertisements in trade journals and trade shows, the larger the SMM’s customer base
Hypothesis 18c	The greater the use of personal sales calls, the larger the SMM’s customer base
Hypothesis 18d	The greater the top management involvement in getting new customers, the larger the SMM’s customer base
Hypothesis 18e	The greater the use of the Internet for getting new customers, the larger the SMM’s customer base
Hypothesis 18f	The greater the reliance on word of mouth, the smaller the SMM’s customer base
Hypothesis 19	The adoption of a strategy of responding to customers’ uncertainty about their own needs is positively associated with a smaller customer base
Hypothesis 20	The greater the share of value added in the supply chain, the smaller the customer base

Summary list of research hypotheses (continued)

Hypothesis 21	The larger the proportion of long-term contracts, the smaller the customer base
Hypothesis 22	A larger customer base is positively associated with lower dependence on a few customers
Hypothesis 23	The stronger the relationships with customers, the higher the growth of the SMM
Hypothesis 23a	The higher the proportion of long-term contracts, the higher the growth of the SMM
Hypothesis 23b	The more coordinative the relationships with major customers, the higher the growth of the SMM
Hypothesis 24	The larger the customer base, the higher the growth of the SMM.
Hypothesis 25	The fairer the relationships with customers, the higher the growth of the SMM

Summary list of research hypotheses (continued)

Hypothesis 25a	The higher the stability of customer schedules, the higher the growth of the SMM
Hypothesis 25b	The higher the joint determination of delivery policies with customers, the higher the growth of the SMM
Hypothesis 25c	The shorter the delivery-to-payment cycle, the higher the growth of the SMM
Hypothesis 26	The stronger the relationships with customers, the better the inventory performance of the SMM
Hypothesis 26a	The higher the proportion of long-term contracts, the better the inventory performance of the SMM
Hypothesis 26b	The more coordinative the relationships with customers, the better the inventory performance of the SMM
Hypothesis 27	The fairer the relationships with customers, the better the inventory performance of the SMM
Hypothesis 27a	The higher the stability of customer schedules, the better the inventory performance of the SMM

Summary list of research hypotheses (continued)

Hypothesis 27b	The higher the joint determination of delivery policies with customers, the better the inventory performance of the SMM
Hypothesis 28	The higher the market requirements focus, the higher the growth of the SMM
Hypothesis 28a	The higher the frequency of product changes, the lower the growth of the SMM
Hypothesis 28b	The more structured the customer requirements that the SMM’s production system responds to, the higher the growth of the SMM.
Hypothesis 29	The greater the SMM’s size, the higher the proportion of long-term contracts.
Hypothesis 30	The greater the geographical distance from major customers the less coordinative the relationships with these customers
Hypothesis 31	The larger the major customers’ size relative to the SMM, the less coordinative the relationships with the these customers

Summary list of research hypotheses (continued)

Hypothesis 32	The larger the major customers' size relative to the SMM, the less fair the SMM's customer relationships	
Hypothesis 32a	The larger the major customers' size relative to the SMM, the lower the frequency of determining delivery policies through negotiation	
Hypothesis 32b	The larger the major customers' size relative to the SMM, the higher the frequency of customer schedule changes after the start of production	
Hypothesis 32c	The larger the major customers' size relative to the SMM, the longer the delivery-to-payment-cycle.	
Hypothesis 33	The larger the major competitors' size relative to the SMM, the weaker the relationships with customers	
Hypothesis 33a	The larger the major competitors' size relative to the SMM, the lower the proportion of long-term contracts	
Hypothesis 33b	The larger the major competitors' size relative to the SMM, the less coordinative the relationships with major customers	

Summary list of research hypotheses (continued)

Hypothesis 34	The higher the number of competitors, the weaker the customer relationships	
Hypothesis 34a	The higher the number of competitors, the lower the proportion of long-term contracts	
Hypothesis 34b	The higher the number of competitors, the less coordinative the relationships with major customers	
Hypothesis 35	The higher the number of competitors, the less fair the customer relationships.	
Hypothesis 35a	The higher the number of competitors, the lower the frequency of determining delivery policies through negotiation	The higher the number of competitors, the lower the frequency of determining delivery policies through
Hypothesis 35b		The higher the number of competitors, the higher the frequency of customer schedule changes after the start of production
Hypothesis 35c	The higher the number of competitors, the longer the delivery-to-payment cycle	

Summary list of research hypotheses (concluded)

Hypothesis 36	The larger the size of customer requirements, the higher the proportion of long-term contracts
Hypothesis 37	The larger the size of customer requirements, the less fair the customer relationships
Hypothesis 37a	The larger the size of customer requirements, the higher the frequency of determining delivery policies through negotiation
Hypothesis 37b	The larger the size of customer requirements, the higher the frequency of customer schedule changes after the start of production
Hypothesis 37c	The larger the size of customer requirements, the longer the delivery-to-payment cycle
Hypothesis 38	Product customisation is positively associated with higher frequency of customer schedule changes after the start of production.
Hypothesis 39	Product customisation is positively associated with lower inventory holdings
Hypothesis 40	SMM age is negatively associated with growth.

6.10 Summary

This Chapter performed a synthesis of the literature, discussed in Chapters 2 and 3, and the findings from the semi-structured interviews with SMMs. This led to the development of a set of testable hypotheses to investigate the role of SMMs in supply chains in terms of managing their customer relationships. In particular, the testing of these hypotheses will allow the study to provide insights into the combinations of factors which influence critical dimensions of customer relationships and SMM growth. The next chapter discusses the design and administration of the survey that was conducted to collect data for hypothesis testing.

CHAPTER 7

THE SURVEY DESIGN AND ADMINISTRATION

7.1 Introduction

In order to test the research hypotheses a mail survey was conducted. Previous empirical studies and the findings from the semi-structured interviews with Small- to Medium- sized Manufacturers (SMMs) were used to design the survey instrument. This was pretested and piloted before reaching its final form. The EMTA database was used to draw the survey sample. The survey was administered by mail to a substantial sample of SMMs in the UK engineering manufacturing industry.

7.2 Construct operationalisation

The selection of measures employed in the survey instrument was based on interview findings discussed in Chapter 5, as well as the existing literature including previous theoretical and empirical studies reviewed in Chapters 2 and 3. One of the primary objectives of the semi-structured interviews was to assess the content validity of the proposed measures as well as the ability of potential respondents to provide data for these particular measures. In addition, a number of questions were taken from the Global Manufacturing Research Group (GMRG) survey [Manchester Manufacturing Management Centre 1994]. This is a survey designed and administered by GMRG researchers with the primary purpose of investigating manufacturing practices globally (see Appendix A for complete list of questions used).

7.3 Pretest and pilot of the survey instrument

Content validity is an assessment of the correspondence of the variables used to measure a concept and its definition [Hair et al. 1998]. In order to ensure content validity, the survey instrument was pretested with the ten SMMs that were visited in the previous stage of the study; two more SMMs were also used for the pretest on the

basis of their willingness to participate in other projects carried out by EMTA. A copy of the draft survey instrument was sent to each of the SMM participants. Some sent the instrument back along with their remarks. Others were contacted by phone to discuss individual items of the instrument. The SMM managers were asked to indicate whether they had encountered any difficulties in answering particular questions, due to ambiguities, lack of data, data confidentiality, and so on. They were also asked to indicate the time it took them to complete the questionnaire and whether the questions reflected the essence of the discussions that had taken place during the interviews (applicable to the ten interviewed SMMs only).

The majority of the pre-test SMMs indicated that survey research is becoming increasingly popular, thus leading to a competitive environment among research projects that intend to employ similar tools. Based on this, some of the SMMs offered additional advice as to the structure and appearance of the survey instrument and the cover letter in order to maximise the response rate. A particular aspect of the final survey instrument design that was implemented referred to ordering of the questions. In order to avoid bias in responses some researchers attempt to completely randomise the order of questions [Babbie, 1990]. Some SMM managers suggested that a questionnaire structure that would allow the potential respondent to understand the reasoning behind the questions would increase the chances of achieving an adequate response rate.

The pre-test of the instrument led to deletion of some questions, the redefinition of others (in terms of the unit of analysis), or the simple rephrasing of questions in order to resolve ambiguities and ensure a common understanding of the questions by potential respondents. Only one of the managers among the participating SMMs indicated that he needed more than half an hour to complete the questionnaire. This was considered a reassuring point -- that questionnaire length or complexity would not be a problem for data collection in the survey.

The cover letter was kept as short as possible (3 paragraphs): it briefly described the nature of the project, requirements from the respondents, and the benefits to them from participating in the survey. Potential respondents were promised to receive a summary report that would provide them with a profile of the research population and data that would allow them to compare some of their practices and performance against the other respondents. In order to boost the response rate, the support of EMTA to the project was underlined and the letter was signed by the Chief Executive of EMTA.

The whole package -- the survey instrument, the cover letter and a return envelope was piloted to a sample of 20 SMMs which had participated in the European ADAPT project "Training Toolkit for SMEs in Supply Chains". The Engineering and Marine Training Authority was the UK collaborator in this project. By virtue of their participation in this project it was thought that these companies were familiar with EMTA activities and moreover that they would exhibit an interest in the project undertaken by this study. Nine completed questionnaires were returned for a response rate of about 50%. An evaluation of responses indicated that respondents found it difficult to provide specific numerical answers to certain questions such as the number of customers, competitors, size of customer orders, production and delivery batches and lead times. This was a problem also encountered in some of the interviews. In order to ensure greater data completeness, it was deemed more appropriate to employ an ordinal categories measurement system instead of interval measurements for the questions mentioned above. No problems were identified for the remaining questions. In addition, responses exhibited an adequate extent of variability. The incorporation of changes suggested by the pilot phase led to the construction of the finalised survey instrument. The survey instrument and the cover letter are shown in Appendix A.

7.4 The survey population

The study targeted companies in the engineering manufacturing industry comprising SIC codes from 27 to 35. Table 7.1 shows the SIC codes that comprise the engineering manufacturing industry in which firms in the sample belong to.

SIC code	Description
27	Manufacture of Metal Products
28	Manufacture of Fabricated Metal Products, except machinery and equipment
29	Manufacture of Machinery and Equipment, not elsewhere classified
30	Manufacture of Office Machinery and Computers
31	Manufacture of Electrical Machinery and Apparatus, not elsewhere classified
32	Manufacture of Radio, Television, and Communication Equipment and Apparatus
33	Manufacture of Medical, Precision and Optical Instruments, Watches and Clocks
34	Manufacture of Motor Vehicles, Trailers and Semi-Trailers
35	Manufacture of Other Transport Equipment

Table 7.1 Research population by sector

The survey sample was drawn from the EMTA database: this database has been used in a number of surveys dealing with training in the UK engineering manufacturing industry and is continuously updated by EMTA in collaboration with the *Yellow Pages Directory*. Given the high mobility in the SME population, such a reliable database could help achieve an adequate response rate.

Table 7.2 shows the distribution of companies in the EMTA database according to size at the time the survey was designed.

No. of employees	No. of companies	Percentage
1-10	59,429	72.5
11-20	10,273	12.5
21-49	6,189	7.5
50-99	2,945	3.5
100-199	1,650	2.0
200-499	1,010	1.2
500-999	257	0.3
1000+	140	0.2
	$\Sigma = 81,893$	100

Source: EMTA database 1998

Table 7.2 Distribution of UK engineering manufacturing companies by size

There are 22,067 firms with 11 to 499 employees. According to Storey (1994) there is no single, uniformly acceptable definition of a small firm. Different researchers have used different ways to define the small and medium-sized company. The term SME itself has been coined by the European Commission. The SME sector is broken down in three sub-sectors:

- micro-enterprises: those with between 0 and 9 employees
- small- sized enterprises: those with 10 to 99 employees
- medium- sized enterprises: those with 100-499 employees

In the largest survey of the SME sector in the UK conducted by the ESRC Centre for Business Research, [1996] a more detailed breakdown was used:

- micro: businesses with less than 10 employees
- small: businesses with between 10 and 99 employees
- medium: businesses with between 100 and 199 employees

- larger: businesses with between 200 and 499 employees

The ESRC research [ESRC 1996] showed that micro firms are highly concentrated in the services sector where they account for approximately two thirds of the firms. On the other hand, small, medium and larger firms are more prominent in manufacturing. Discussions with experts and with EMTA verified that the objectives of the research would be better served if the study adopted a size of 10 employees as a minimum threshold. There was an agreement that the research aimed at investigating management processes that require a formalisation which may exist in a manufacturing company only after a “critical mass” in terms of size has been achieved. It was therefore decided that the micro businesses should be excluded from the research.

The classification used by the ESRC study was adopted as a guide to draw a representative sample of companies with 10 up to 499 employees (proportionally drawn from the small, medium and larger business categories). The sample was also representative in terms of SIC codes and geographical regions. The latter was achieved by using the latest data available from EMTA [EMTA 1998] with regard to the distribution of engineering manufacturing sites by region.

A sample of 2,000 engineering SMM companies was drawn from the EMTA database. The sample was representative of SIC codes, employment size bands within the SMM sector, and geographical region. Attention was given to exclude from the final sample the companies which had participated in the pretest and pilot stages of the survey.

7.5 Survey administration

The survey was sent to Managing Directors since it was felt that they would have an overview of the issues of interest to the research. The survey was conducted in two waves. The first wave resulted in the return of 186 questionnaires. In order to boost

the response rate, a second wave followed approximately three weeks after the first one. A reminder letter and a copy of the survey instrument were sent to a sub-sample of 330 SMMs from the original sample. This resulted in the return of 22 questionnaires. Overall, thirty-one companies notified that they could not participate in the survey. The majority of these were distributors, dealers and stockists for which the survey was inappropriate, two companies were unwilling to participate; two did not fall in the SMM category (they had more than 500 employees) and two had ceased to trade. This verified that the EMTA database was relatively up to date.

Two companies completed the questionnaire but also suggested that they operated in service industries (without giving more detail): they were therefore excluded from the analysis. Six more respondents were excluded from the analysis because of a large portion of incomplete data in their responses (whole pages of the questionnaire missing). This led to an effective sample of 202 usable questionnaires for a response rate of at least 10%. This is consistent with response rates achieved by previous surveys administered by EMTA in the UK engineering manufacturing industry.

7.6 Summary

This study performed a mail survey to collect data for testing the research hypotheses. Particular attention was given to the design of the survey instrument. The successive stages of semi-structured interviews, pre-test and pilot of the survey aimed to ensure content validity of the survey instrument. In parallel, an up-to-date database was used, and support from an outside organisation was sought to ensure an adequate response rate. The following Chapters discuss analyses of the data collected.

CHAPTER 8
DATA SCREENING

8.1 Introduction

Prior to the main analysis, the data set is screened to identify any underlying processes that may create problems in performing the analysis and evaluating the results from it. This Chapter assesses the existence of nonresponse bias, evaluates the extent and nature of missing data and outliers and discusses the approaches adopted to tackle these issues.

8.2 Sample representativeness

The profile of the survey participants was examined to identify whether the sample demographics exhibit patterns similar to the SMM population. Figure 8.1 shows the distribution of survey participants in terms of size.

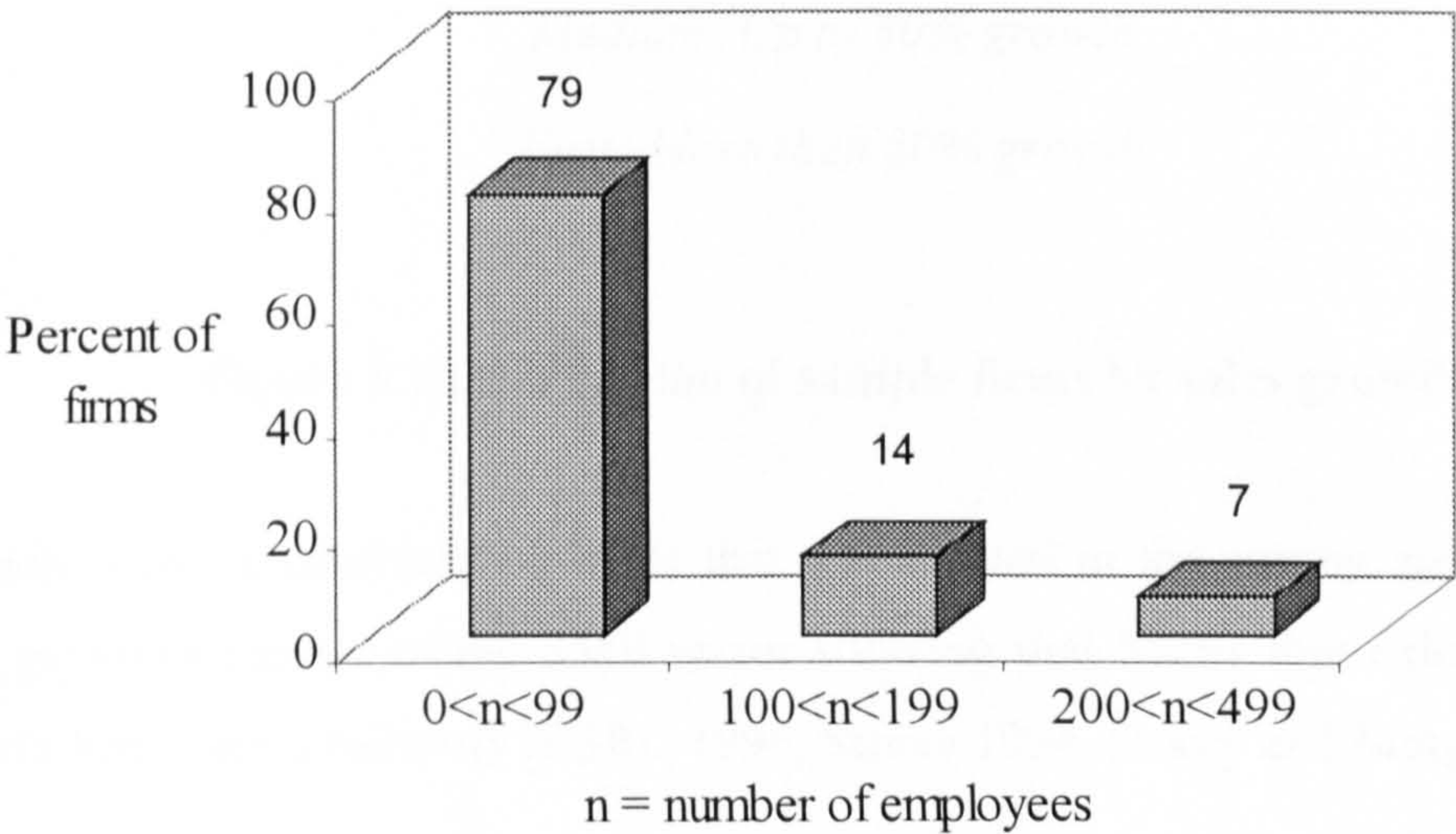
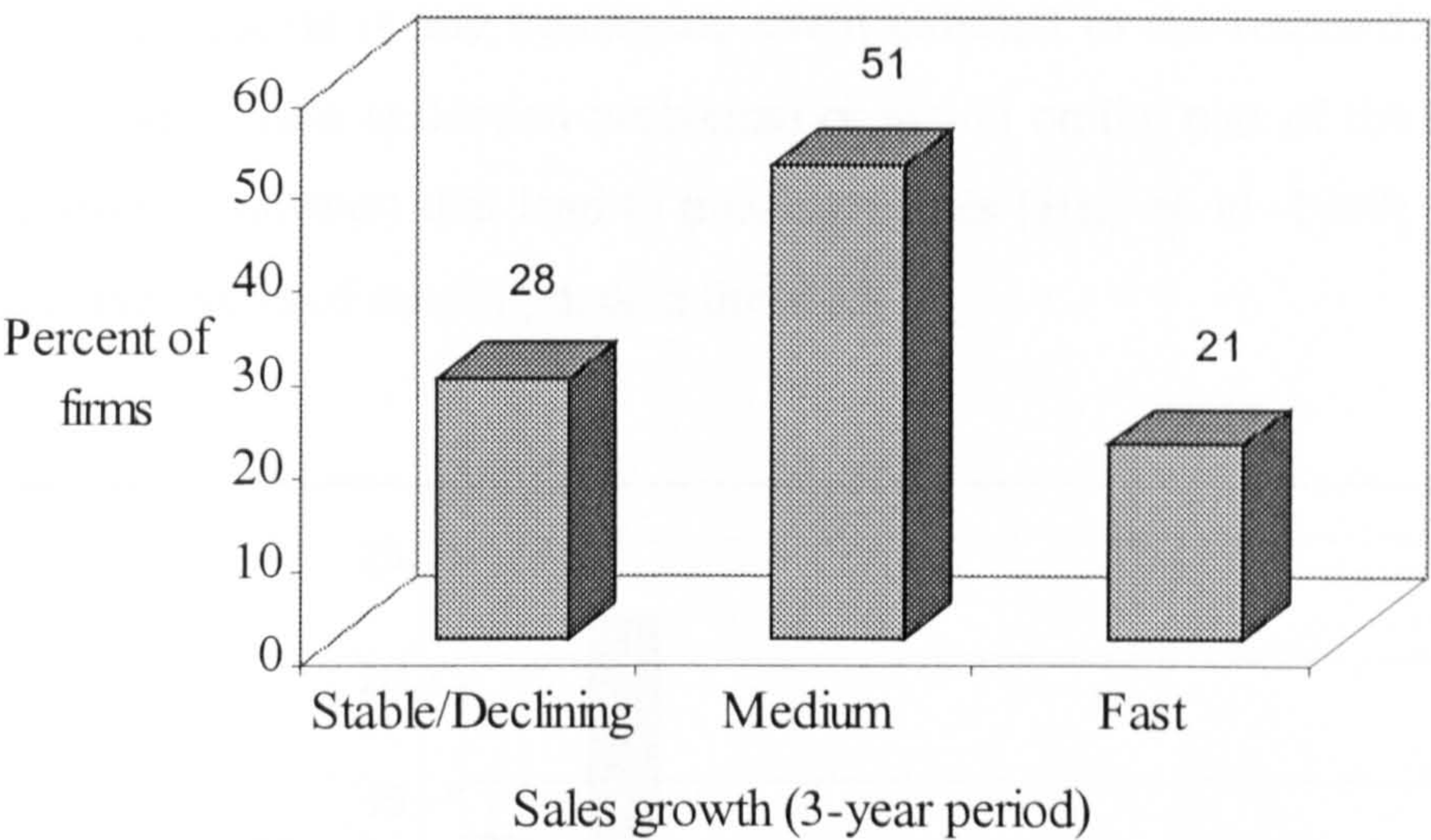


Figure 8.1 Distribution of sample firms by employment size

The distribution of the participating firms in terms of size is quite comparable with the distribution of the population in the EMTA database from which the sample was drawn (see Table 7.2).

Figure 8.2 shows the distribution of the survey participants in terms of sales growth.



Stable/Declining: Negative or zero growth

Medium: Up to 30% growth

Fast: More than 30% growth

Figure 8.2 Distribution of sample firms by sales growth

Growth patterns exhibited by firms that participated in the survey are in agreement with previous studies of the SME sector showing that SMEs that exhibit significant growth levels are a minority [ESRC 1996, Storey 1994, Storey and Morgan 1998].

Sample demographics in terms of employment size and growth suggest that the study sample follows patterns similar to those that the SMM population follows. This means that the sample appears to be representative of the population.

Following Armstrong and Overton [1977], nonresponse bias was assessed by comparing earlier (n=182) versus later (n=20) respondents on the variables included in the survey. The *t*-tests that were performed did not reveal any significant

differences between the two groups, thus leading to the conclusion that nonresponse bias did not appear to be a problem in this study.

8.3 Analysis of missing data

A missing data process is any systematic event external to the respondent (such as data entry errors or data collection problems) or action on the part of the respondent (such as refusal to answer) that lead to missing values [Hair et. al. 1998]. Figure 8.3 summarises the extent of missing data in the study.

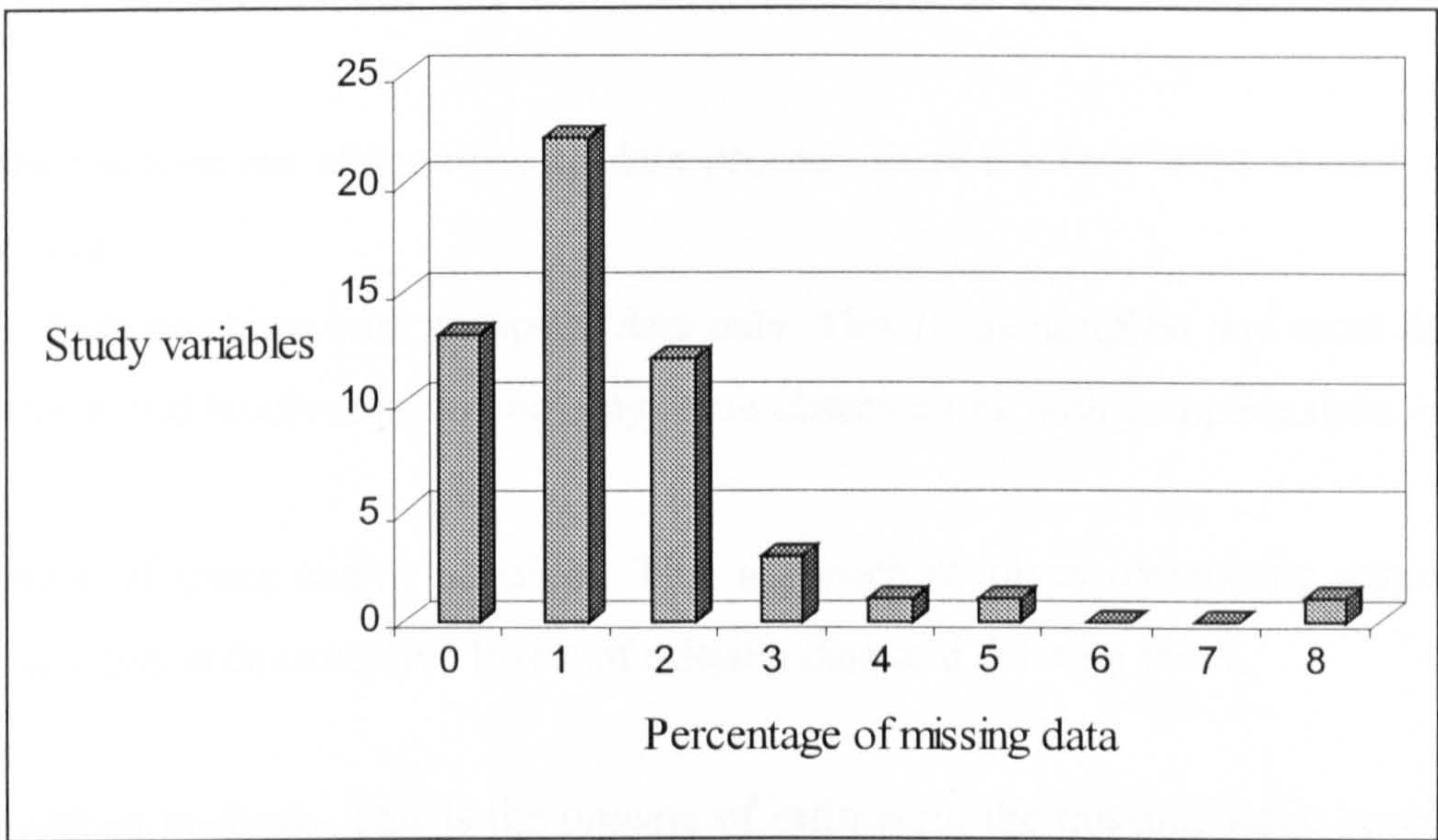


Figure 8.3 Extent of missing data in the study

As shown in Figure 8.3, the extent of missing data is of marginal concern for the analysis. A visual inspection of data showed that missing data are widely dispersed among the responses. Dichotomised correlations were calculated in order to assess the correlation of missing data for any pair of variables. Significant correlations were found within the following groups of variables:

- use of marketing tools
- information on competitors (size, performance relative to competition)
- dimensions of relationships and in particular percentage of sales covered by long-term contracts, percentage of time spent on control vs. coordinating tasks, and dependence.

These variables exhibit levels of missing data in the range of 1 to 2%. In terms of the relationships between dependent and independent variables no significant dichotomised correlations were found. It is evident that the extent and pattern of missing data cannot justify the existence of an underlying missing process.

The evaluation of the above findings led to the conclusion that the missing data process can be classified as missing completely at random (MCAR). This process is applicable when missing values of Y are not dependent on X, that is, there is no underlying process that lends bias to the observed data [Hair et. al. 1998].

Given the randomness of the missing data process, there are four ways to deal with missing data:

1. Use of observations with complete data only. This is the simplest and most direct approach and involves including only those observations with complete data.
2. Deletion of cases and/or variables. This approach involves identifying variables and/or cases with excessive levels of missing data and deleting them.
3. Imputation methods. This is the process of estimating the missing value based on valid values of other variables and/or cases in the sample. There is a large number of imputation methods that can be used (see Hair et. al. 1998).
4. Model-based procedures. These procedures explicitly incorporate the missing data into the analysis. This can take the form of an estimation technique that attempts to make the most accurate and reasonable estimates possible or that of a direct inclusion of the missing data in the analysis. In the latter case, observations with missing data are defined as a select subset of the sample [Hair et al. 1998].

An examination of the pattern of missing data in the study sample showed a wide scatter of missing data across cases and variables. This meant that an approach based

on using observations with complete data only or deleting cases and/or variables would result in the unnecessary loss of a large amount of information.

It was therefore decided that an imputation method should be used – in particular, the mean substitution which is the most common and easiest to implement method [Hair et al.1998]. A distinction should be made, however, with regard to the nature of the variables treated this way. Mean substitution is a legitimate approach only when dealing with missing data for independent variables. It is not acceptable to force dependent variables to take specific values.

Therefore, the use of mean substitution was restricted to independent variables only. Missing data on dependent variables were treated by the use of observations with complete data only.

8.4 Outliers

Outliers are observations with a unique combination of characteristics identifiable as distinctly different from the other observations [Hair et al. 1998]. They can be classified into four categories:

- Those due to a procedural error or a mistake in coding
- Those that occur as result of an extraordinary event, which then is an explanation for the uniqueness of the observation
- Those extraordinary observations for which there is no explanation
- Those that fall within the ordinary range of values on each of the variables but are unique in their combination of values across the variables.

As a first step for detecting outliers in the sample, data were screened in order to identify any errors in the data entry process. The next step involved the univariate detection of outliers by examining the distribution of observations and focusing on those cases that fell at the outer ranges of the distribution. Data values were converted to standard scores. For samples with more than 80 observations, the guidelines suggest identifying those cases with standard scores ranging from 3 to 4 as outliers [Hair et al. 1998].

Table 8.1 summarises the results of this analysis by adopting a threshold value of 3.

Variable	Values with standard scores>3
CONTRCT1	100
	100
DEPNDNCE	100
EMP_NO	290
	300
	320
	300
	400
EXPORT	333
	85
	90
	90
	85
GROWTH	151.85
	122.22
	129.17

Table 8.1 Assessment of univariate outliers

It is evident from Table 8.1 that very high percentage of contracts, dependence, export intensity, or growth rates constitute departures from the general characteristics of the sample population. This does not mean, however, that they do not represent a valid segment of the SMM population even if this is a small one. Previous studies, [for example ESRC 1996, The Sunday Times 1998], have shown that only a small minority of SMMs achieves growth and in particular at the levels shown in Table 8.1. The small proportion of larger SMMs in the sample appears to be proportional with the characteristics of the SMM population as illustrated in Table 7.2 (EMTA database). On the other hand, there is no theoretical prescription or empirical evidence

to suggest that the levels of contracts, export intensity and dependence shown in Table 8.1 do not represent a valid segment of the SMM population.

An assessment of multivariate outliers was also performed using the Mahalanobis D^2 measure. This evaluates the position of each observation compared with the centre of all observations on a set of variables [Hair et al. 1998, Tabachnick et al. 1989]. Fifty-three variables were included in the analysis. Two observations had D^2 greater than $\chi^2(53) = 90.5$.

An examination of these two observations did not reveal any reasons for their exclusion from the analysis. One observation referred to a company with the highest degree of dependence in the sample and the lowest number of customers. In particular the company had two customers which accounted for 100% of its sales; this was covered by long-term contracts.

The second observation did not exhibit any particular combination of variable values that would justify its characterisation as an extraordinary case.

An assessment of the analysis performed for detecting univariate and multivariate outliers suggested that there were no theoretical reasons for excluding any of the above cases as outliers. As Hair et al. [1998] suggest, outliers should be deleted if they are not representative of any segment of the population. If they do represent a segment of the population they should be retained in order to ensure generalisability to the entire population. As it was felt that this was the case in the study sample, the decision was made to retain these cases for subsequent analysis.

8.5 Assumptions of multivariate analysis

Prior to the main stage of analysis, data were examined as to whether they met the fundamental assumptions of multivariate analysis -- namely normality, homoscedasticity, and linearity. Assessment of the conformance of the data set to these assumptions was performed in the context of the specific analyses that were

conducted -- that is, factor analysis and multiple regression analysis. These tests are described in subsequent chapters.

8.6 Summary

The initial screening of data suggested that there are no underlying processes that might render application of the main analytic techniques or the interpretation of results problematic. The main data analysis performed in this study is discussed in the following chapters.

CHAPTER 9

RELATIONSHIP MANAGEMENT ACTIVITIES OF SMMs

9.1 Introduction

The first stage of the analysis involves factor analysis of the relationship management activities employed by SMMs. The prime objective of factor analysis for this study is data reduction -- that is, to produce a new set of variables, much smaller in number, that incorporates the character and nature of the original variables. This set will be used in subsequent stages of the analysis -- multiple regression and cluster analysis.

9.2 Compliance with the statistical assumptions of factor analysis

A complete list of the study variables and their names is shown in Appendix B. Table 9.1 provides descriptive statistics for the variables that were factor analysed.

Variable	Mean	Median	Standard deviation	Skewness	Z _{skewness}	Kurtosis	Z _{kurtosis}
C_LINK1	1.48	1	1.09	4.39	25.47	2.34	6.78
C_LINK2	1.48	1	1.01	3.14	18.21	2.05	5.94
C_LINK3	1.43	1	1.02	2.52	14.62	0.34	0.98
CU_KNOW1	4.31	5	0.85	-1.18	-6.84	1.25	3.62
CU_KNOW2	3	3	1.11	0.2	1.16	-0.45	-1.30
CU_NOTIF	2.81	3	1.19	0.41	2.37	-0.63	-1.82
DR_COMM1	2.08	2	1.23	0.98	5.68	-0.03	-0.08
DR_COMM2	2.47	2	1.31	0.45	2.61	-0.88	-2.55
FEEDBCK1	3.66	4	1.17	-0.54	-3.13	-0.67	-1.94
FEEDBCK2	4.06	4	0.98	-0.77	-4.46	-0.31	-0.89
FEEDBCK3	4	4	0.99	-0.61	-3.53	-0.60	-1.74
FEEDBCK4	3.83	4	1.11	-0.54	-3.13	-0.64	-1.85
PR_TYPE1	61.28	80	40.06	-0.41	-2.34	-1.57	-4.55
PR_TYPE2	24.6	5	33.31	1.09	6.41	-0.34	1.01
PR_TYPE3	13.81	0	27.34	2.24	22.37	3.80	11.18
TAC1	3.30	3	1.35	-0.30	-1.74	-1.11	-3.22
TAC2	3.26	3	1.33	-0.33	-1.91	-1.03	-2.98
TAC3	2.52	2	1.29	0.34	1.97	-1.00	-2.90
V_FOCUS1	3.24	3	1.36	-0.37	-2.14	-1.06	-3.07
V_FOCUS2	2.83	3	1.39	0.11	0.63	-1.27	-3.68
V_FOCUS3	2.97	3	1.28	-0.04	-0.23	-1.07	-3.10
V_FOCUS4	2.5	2	1.36	0.42	2.43	-1.05	-3.04
V_FOCUS5	2.90	3	1.42	0.09	0.52	-1.26	-3.65

Table 9.1 Descriptive statistics of the variables to enter factor analysis

According to Hair et al. [1998], a simple test of normality is based on the skewness and kurtosis values. Hair et al. [1998] provide the following critical z values for rejecting the assumption about the normality of a distribution:

$$\pm 2.58 \text{ at } p=0.01$$

$$\pm 1.96 \text{ at } p= 0.05$$

As illustrated in Table 9.1, the majority of distributions exhibit weak to moderate levels of skewness and kurtosis, apart from the variables C_LINK1, C_LINK2, C_LINK3 and PR_TYPE3. This is supported by a visual examination of the distributions of variables. A number of transformations were applied to the rest of the variables. It became possible to improve the distribution of the variable PR_TYPE3 as shown in Table 9.2:

Variable	Transformation	Skewness	Z _{skewness}	Kurtosis	Z _{kurtosis}
PR_TYPE3	LOG(1+PR_TYPE3)	0.842	4.95	-0.806	2.37

Table 9.2 Transformed variable to enter factor analysis

For factor analysis it is critical that honest, reliable correlations are employed [Tabachnick and Fizzell 1989, Hair et al., 1998]: the critical assumptions are more conceptual than statistical. From a statistical standpoint, departures from normality, homoscedasticity and linearity apply only to the extent that they diminish the observed correlations [Hair et al. 1998]. As seen in Table 9.1, skewness and kurtosis values are in the same direction for groups of variables that are expected to be correlated -- for example, variables related to various forms of feedback, variables related to responding to customers' uncertainty about their own needs, variables related to the scope and intensity of inter-organisational IT use, etc.. Therefore, the danger of diminished correlations due to departures from normality does not appear to be significant. Furthermore, examination of scatterplots for all pairs of the variables to be included in the analysis did not reveal any non-linear relationships.

It is concluded, therefore, that the assumptions of multivariate analysis are not violated to a degree that would render the use of factor analysis invalid.

9.3 Choice of the factor analysis method

According to Tabachnick and Fizzell [1989], principal components analysis is the most appropriate choice when the objective of the research is primarily to reduce a large number of variables down to a smaller number of components. For this study, the primary objective of this stage of analysis is data reduction -- that is, to produce a new set of variables, much smaller in number, that incorporates the character and nature of the original variables. This set can then be used in subsequent stages of the analysis -- multiple regression and cluster analysis.

The final test of this analysis is its interpretability. The final choice among alternatives depends on the researcher's assessment of its interpretability and scientific utility.

9.4 Assessment of the appropriateness of factor analysis

Twenty-two variables pertaining to relationship management activities were factor analysed. The sample of 202 cases satisfies the minimum ratio of observations to variables (five-to-one) and exceeds to the ten-to-one ratio that some researchers suggest [see Hair et al. 1998]. In order to assess the factorability of the correlation matrix, a visual examination of the correlations was initially performed. This revealed that a large number of intercorrelations were significant at the 0.01 level. In order to quantify the degree of intercorrelations among variables and the appropriateness of factor analysis two measures can be employed: 1) the measure of sampling accuracy (MSA) which is an index ranging from 0 to 1, reaching 1 when each variable is perfectly predicted without error by the other variables, and 2) the Bartlett test of sphericity which provides the statistical probability that the correlation matrix has significant correlations among at least some of the variables.

For the study data MSA was 0.697, well above the minimum 0.50, and the Bartlett test of sphericity showed that non-zero correlations existed at the significance level of 0.00001. Factor analysis was therefore deemed an appropriate method of analysis for the data set.

Following the recommendations by Hair et al. [1998] factor loadings of ± 0.50 or greater are considered practically significant. Based on this threshold, two variables failed to load significantly on any one factor – namely, CU_KNOW1 (“managers’ knowledge of customer processes and product use”) and V_FOCUS5 (“offering consulting to customers on areas that the company has expertise”). These two variables were therefore deleted and a factor analysis was performed using the remaining variables. This analysis showed that the variable CU_NOTIF was distinct from other relationship management activities and loaded highly on a factor characterised only by the absence of products made-to-stock. This suggested that the particular practice is subsumed within the nature of the SMM’s products, rather than being adopted in the context of specific strategies for managing customer relationships. For this second run, which was adopted as the final solution, the MSA value was 0.65 (again well above the minimum 0.50) and the Bartlett test of sphericity showed that non-zero correlations existed at the significance level of 0.00000.

The analysis was also performed after omitting the variables which refer to the use of IT as these exhibit strong departures from normality (see Table 9.1). The derived factors remained the same in terms of structure, thus providing an assurance that departures from the statistical assumptions do not affect the factor solution.

9.5 The factor solution

Following recommendations by Hair et al. [1998], the latent root criterion -- whereby eigenvalues greater than 1 are considered significant -- was used as the initial guide for extraction of the optimum number of factors. After the initial solution of seven factors was derived, computation of several additional trial solutions took place, including one less factor than the initial number and two or three more factors that were initially derived. In addition, two more criteria were used: the percentage of the total variance explained by the extracted factors and the scree test criterion. The final test however, is factor interpretability [Hair et al. 1998, Tabachnick et al. 1989].

Examination of the unrotated factor matrix revealed that the first factor -- which accounts for the largest amount of variance -- is a general factor, with a large number of variables having a high loading. Some of the same variables had a higher loading on the second factor, too. This factor loading pattern points to the need to rotate the factor matrix in order to obtain theoretically meaningful factors. Assessment of structure in the interpretation phase resulted in the adoption of the 7- factor solution as the most appropriate. The seven factors had a cumulative explanatory power of 70%.

Table 9.3 contains the information regarding the 7 factors and their relative explanatory power.

Factor	Eigenvalue	Percent of variance	Cumulative percent of variance
1	4.64	22.1	22.1
2	2.63	12.5	34.7
3	2.15	10.3	44.9
4	1.65	7.9	52.8
5	1.39	6.6	59.5
6	1.12	5.3	64.8
7	1.08	5.2	70.0

Table 9.3 Results for the extraction of component factors

As shown in Table 9.3, the eigenvalue of Factor 7 is slightly less than 1 and therefore can be included in the solution. The total percent of variance explained is well above 60% which is proposed as a threshold by some researchers for research in social sciences [Hair et al. 1998].

In selecting among rotational methods, one has to make a choice between orthogonal or oblique rotation. Given the objectives of this study -- to reduce the number of variables to a smaller set of variables for subsequent use in regression analysis -- an orthogonal solution seemed more appropriate [Hair et al.1998]. Orthogonal rotation

however, assumes that the theoretical underlying dimensions are uncorrelated. It is expected from the hypotheses of the study that factors will be correlated. This situation, which is usually a more realistic one, favours the use of an oblique solution [Hair et al.1998].

Exhibit 9.1 shows the rotated factor matrix that was obtained using the VARIMAX technique which is an orthogonal rotation. The communalities of the variables are also shown in this Exhibit. An oblique rotation was also performed, using the Direct Oblimin technique and the solution in terms of interpretation was identical. This led to an even greater confidence in the analysis results.

9.6 Validation

The split sample method was used to validate the results of the factor analysis. Exhibits 9.2 and 9.3 show the results of the split-sample estimation with VARIMAX rotation.

Exhibit 9.1
The factor matrix

Variable	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Communality
Customer feedback on product design, performance, features	0.5653	0.2162	0.4586	0.1045	0.0401	0.0475	-0.0604	0.59
Assistance in applications development	0.7223	0.3436	-0.0065	0.0021	0.0544	-0.1670	0.1122	0.68
Undertake formal product design and development	0.7851	0.0889	0.2168	0.0793	0.0591	-0.0619	0.1111	0.69
Influence product design	0.7325	0.0619	0.1924	-0.0008	0.1730	0.0718	0.1682	0.64
Education/training in product use	0.3382	0.5874	-0.0029	0.0213	0.0754	0.3051	-0.2138	0.60
Quantify the impact on customer's performance	0.0948	0.7966	0.0811	-0.0084	0.0530	0.0303	-0.0456	0.65
Cost savings suggestions	0.0952	0.7943	0.1451	0.0620	0.0620	-0.0246	0.0476	0.67
Provide technology forecasts	0.1684	0.7073	0.0578	0.0918	0.0286	0.1705	0.0982	0.58
Customer feedback on quality performance	0.3439	0.1031	0.7710	0.0915	-0.0098	-0.0374	-0.0426	0.73
Customer feedback on delivery performance	0.2332	0.321	0.8125	0.1210	0.0676	-0.0740	-0.0428	0.74
Customer feedback on cost	-0.0514	0.1065	0.8109	0.0288	0.0765	-0.0421	-0.0002	0.69
Computer links for order processing	-0.0087	-0.0878	0.1504	0.8531	-0.0101	0.1073	0.0282	0.76
Computer links for product design	0.1535	0.1535	-0.0744	0.5574	-0.1082	-0.1708	0.0449	0.51
Computer links for production scheduling	0.0523	0.0523	0.1277	0.9082	-0.0612	-0.0215	0.0282	0.85
Employees' knowledge of customer processes	0.2405	0.0850	0.0744	0.0351	0.6437	-0.1431	-0.0742	0.51
Employees manage customer orders	-0.1426	0.0634	0.0483	-0.0291	0.8660	0.1238	-0.0352	0.79
Employees discuss product/process features with customers	0.1631	0.0296	0.0185	-0.1282	0.8270	-0.0799	0.0677	0.74
Percent of custom products	0.1514	-0.2155	0.0552	0.0056	0.0203	-0.7635	0.5155	0.93
Percent of products MTO from a catalogue	-0.0121	0.1386	-0.0101	-0.0109	-0.0889	0.9489	0.0925	0.94
Percent of products MTS	-0.2103	0.1474	0.0429	0.0060	0.0797	-0.0366	-0.0868	0.83
Customer notification for changes	0.0480	0.2120	0.2358	0.1009	0.0375	-0.1241	0.6296	0.52

Exhibit 9.2
Validation of factor analysis by split-sample estimation with VARIMAX rotation : Sample 1

Variable	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Communality
Customer feedback on product design, performance, features	0.5663	0.3006	0.4111	0.0797	0.0191	-0.0347	-0.0636	0.5920
Assistance in applications development	0.6946	0.3718	0.0726	-0.0857	0.1171	-0.1047	0.2067	0.7008
Undertake formal product design and development	0.8336	0.0317	0.1617	-0.0044	0.0330	0.0250	0.1484	0.7462
Influence product design	0.7290	-0.0290	0.2056	0.0486	0.2562	0.1133	0.2297	0.7082
Education/training in product use	0.3680	0.5603	0.0734	-0.0608	0.0648	0.3276	-0.1809	0.6029
Quantify the impact on customer's performance	0.0156	0.8249	0.1346	-0.0868	0.0534	0.1970	0.0957	0.7573
Cost savings suggestions	0.0771	0.7823	0.1099	0.1406	0.1736	-0.0157	0.0962	0.6895
Provide technology forecasts	0.1427	0.7493	-0.0808	0.0129	-0.0114	0.0099	-0.0132	0.5889
Customer feedback on quality performance	0.3923	0.1243	0.7135	0.1228	-0.0522	-0.1408	-0.0782	0.7223
Customer feedback on delivery performance	0.2986	0.0707	0.7776	0.1305	-0.0262	-0.1421	-0.0926	0.7454
Customer feedback on cost	-0.0422	-0.0177	0.8226	-0.0015	0.1035	-0.0092	0.1885	0.7251
Computer links for order processing	-0.0692	-0.1049	0.1344	0.8701	0.0276	0.1143	0.1228	0.8204
Computer links for product design	0.4691	0.3017	-0.2235	0.4203	-0.2852	-0.1316	-0.0689	0.6412
Computer links for production scheduling	0.0741	0.0891	0.0833	0.9002	-0.1197	-0.0002	-0.0006	0.8451
Employees' knowledge of customer processes	0.1240	0.2089	0.2197	-0.0857	0.5947	0.0281	-0.1321	0.4866
Employees manage customer orders	-0.0430	0.0062	-0.0726	-0.0272	0.8458	0.1079	-0.0850	0.7421
Employees discuss product/process features with customers	0.2093	0.0587	-0.0572	-0.0372	0.8364	-0.2478	0.0439	0.8150
Percent of custom products	0.0669	-0.1361	0.0795	-0.0783	-0.0823	-0.8723	0.4020	0.9648
Percent of products MTO from a catalogue	0.0544	0.1365	-0.1898	0.0416	-0.1352	0.8726	0.1571	0.8639
Percent of products MTS	-0.1580	0.0418	0.1000	0.0658	0.2716	0.2705	-0.7570	0.7611

Exhibit 9.3

Validation of factor analysis by split-sample estimation with VARIMAX rotation : Sample 2

Variable	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Communality
Customer feedback on product design, performance, features	0.5616	0.4746	0.1536	0.1381	-0.1936	-0.0309	0.0311	0.6279
Customer feedback on quality performance	0.8283	0.2515	0.0987	0.1022	0.0056	-0.0309	0.0311	0.7895
Customer feedback on delivery performance	0.8524	0.1310	0.0072	0.1236	0.0615	0.1273	0.0511	0.7818
Customer feedback on cost	0.7592	-0.0728	0.2380	0.0839	0.2332	0.0277	-0.0935	0.7094
Assistance in applications development	-0.00704	0.7396	0.2637	0.0747	0.0991	0.0175	0.0158	0.6326
Undertake formal product design and development	0.3053	0.7185	0.1859	0.1057	0.1405	0.0723	0.0486	0.6827
Influence product design	0.1857	0.7109	0.2705	-0.0782	0.0935	0.0669	0.1838	0.6662
Education/training in product use	-0.0565	0.2499	0.6421	0.0867	-0.3721	0.1081	-0.0250	0.6362
Quantify the impact on customer's performance	0.0982	0.2777	0.5569	0.0778	-0.1354	0.1177	-0.2136	0.4808
Cost savings suggestions	0.1798	0.1329	0.7896	-0.0113	0.1168	-0.0344	0.1366	0.6918
Provide technology forecasts	0.1717	0.1632	0.7721	0.1256	-0.0717	0.0090	0.0984	0.6831
Computer links for order processing	0.1014	-0.0968	0.2177	0.8505	0.0063	-0.0309	0.0311	0.7925
Computer links for product design	0.1140	0.3532	-0.0924	0.6152	0.0302	-0.0027	-0.0283	0.5265
Computer links for production scheduling	0.1262	0.0127	0.0657	0.9053	0.0730	-0.0548	0.0128	0.8486
Percent of custom products	0.0128	0.3421	-0.3496	0.1236	0.7402	0.1183	0.2601	0.8842
Percent of products MTO from a catalogue	0.0407	-0.2505	0.2984	-0.1151	-0.7596	-0.0916	0.4065	0.9174
Customer notification about changes	0.3199	-0.0512	0.2129	-0.0159	0.6811	0.0132	0.3030	0.7064
Employees' knowledge of customer processes	0.0062	0.3299	-0.0633	0.1482	0.1616	0.6776	0.0151	0.6204
Employees manage customer orders	0.0912	-0.2571	0.1985	-0.0285	0.0134	0.8407	0.0236	0.8222
Employees discuss product/process features with customers	0.1311	0.1305	-0.010	-0.1844	-0.0304	0.8224	0.0159	0.7416
Percent of products MTS	-0.0712	-0.1912	0.1338	-0.0333	-0.1136	-0.0557	-0.9206	0.9242

9.7 Interpretation of the Factor Matrix

The first run of the factor analysis identified two variables that did not load highly on any factor and whose communalities were low. The first variable measures the extent to which managers in SMMs have a “knowledge of their customers’ processes and how customers use their products”. The communality index for this variable was 0.36 which was deemed quite low. Examination of the distribution of this variable -- in particular in conjunction with the variables intended to measure shop floor employees’ “knowledge of customer processes and product use” (see Table 9.1) -- shows that, when it comes to SMM managers, the vast majority of respondents considers them as very knowledgeable of customers’ processes and product use. Responses with regard to shop floor employees’ knowledge and involvement exhibit a much higher variability. This is reflected in the fact that there was a wide discrepancy in the factor loadings for CU_KNOW1 on the one hand (0.48) and the variables intended to measure shop floor employee knowledge and involvement (0.77 at least). This was considered an indication of the existence of two different processes in place -- one referring to managerial staff and the other to shop floor employees. Given that the use of a single indicator for managerial staff would not ensure an adequate level of reliability and validity, it was decided that it would be preferable to eliminate CU_KNOW1 from the analysis.

The second variable that did not load highly on any factor and exhibited low commonality (0.45), referred to the provision of consulting services to customers in areas that the SMM has expertise. In the sample of companies that were interviewed, consulting services would be related to the actual product/service offered. Given that the particular variable did not load highly on the same factor with the variables measuring the provision of services aiming to reduce customers’ uncertainty about their own needs or the variables measuring the adoption of a total acquisition cost approach, it was decided that it would be preferable to eliminate the variable from subsequent analysis rather than attempt to represent a concept using a single indicator.

Interpretation of the interrelationships shown in the factor matrix led to the development of five factors which correspond to relationship management activities employed by SMMs. These factors are discussed below.

Factor 1: Responding to customers' uncertainty about their own needs.

Activities include assisting customers in applications development, undertaking formal product design and development, influencing product design if not formally undertaken. Feedback from customers on product design, performance and desired features also loaded significantly on this factor. This is particularly important since, as shown below, remaining forms of feedback load significantly on another factor. This indicates that this specific form of feedback is inextricably linked to the strategy of being a solution provider for customers.

Factor 2: Adoption of a total acquisition cost approach

Activities include quantifying the impact from the use of the SMM's product on customer's performance, suggesting how cost savings can be made over the years, providing information about future technological developments for this product, and providing education/training in product use. These activities address the ultimate, according to some, criterion on which customers base their buying decisions, or at least the rational component of the buying decision as other researchers suggest, that is, the least total cost in use.

Factor 3: Getting feedback from customers

Areas include the SMM's quality and delivery performance as well as costs incurred by the customer.

Factor 4: Computer links with customers

Applications include order processing, product design and production scheduling.

Factor 5: Devolution of responsibility for supply chain management to the shop floor

Activities aim towards realising the *service factory* and the *service-profit chain* concepts: having shop floor employees that are knowledgeable of customers' processes and how customers use the SMM's products, as well as empowering shop

floor employees to manage customer order placing and execution and to discuss product/process features with customers.

The last two factors represent the nature of the SMM's products. The first apparent conclusion is that there is a polarisation of SMMs in terms of production environments: that is, SMMs are predominantly either customisers, Make-to-Stock (MTS) or Make-to-Order (MTO) manufacturers. It is also important that product customisation did not load significantly on any of the factors describing the relationship management activities employed by SMMs. The same held true for MTS or MTO manufacturing. This suggests that customer relationship management means explicitly devising strategies and implementing programs that form a bundle of services parallel to the firm's product offering. This analysis also showed that the variable CU_NOTIF was distinct from other relationship management activities and loaded highly on a factor characterised only by the absence of products made-to-stock. This suggested that the particular practice is subsumed within the nature of the SMM's products, rather than being adopted in the context of specific strategies for managing customer relationships. In support of this finding, the semi-structured interviews with SMMs suggested that in many cases, the particular practice has to do more with complying with contractual terms rather than a practice aiming to signal a relational behaviour towards customers.

9.8 Selection of data reduction method

The primary objective of the factor analysis for this study was to reduce the number of original variables measuring relationship management activities into a smaller set of variables that incorporate the character and nature of the original variables and can be used in subsequent stages of analysis, that is, multiple regression and cluster analysis. A decision has to be made whether surrogate variables, summated scales, or factor scores should be used in these subsequent stages of analysis.

Hair et al. [1998] provide a detailed discussion of the relative advantages and disadvantages of the three methods. The construction of summated scales appears to

be the preferred method provided that there is adequate evidence of validity and reliability. Under these conditions, summated scales can represent a multifaceted concept better than surrogate variables and, at the same time, ensure an easier replication of the study than factor scores. Furthermore, they do not necessarily have to be uncorrelated if there is a need to avoid complications in their use in other multivariate techniques [Hair et al.1998]. As shown in Chapter 6 (hypotheses H₇ and H₁₀), factors representing relationship management activities are expected to be correlated.

9.9 Conceptual assumptions of factor analysis

The issues of conceptual definition, dimensionality, reliability, and validity in constructing a summated scale are addressed prior to the decision for employing summated scales. Definition of the concepts involved in the particular research context has been covered in Chapters 2 and 3. Interviews with SMMs discussed in Chapter 5, as well as the pre-test and pilot stages of the questionnaire, provided adequate evidence of face validity -- that is, correspondence of the variables to be included in the summated scales and their conceptual definition. In addition, other researchers have employed a number of these variables in previous studies [e.g., Ellram and Hendrick 1995, Bensaou and Venkatraman 1995, Chaston 1998] and have provided more evidence of face validity.

An essential requirement for the construction of a summated scale is that the items are unidimensional -- that is, they are strongly associated with each other and represent a single concept [Hair et al. 1998]. Examination of the factor matrix shows that each summated scale consists of items loading significantly high on a single factor, thus providing adequate evidence of unidimensionality.

In terms of the reliability of the summated scales, examination of Table 9.4 shows that Cronbach's alpha values are well above the minimum recommended 0.70 or even 0.60 for exploratory research (Nunnally 1978, Hair et al. 1998).

Factor	Label	Cronbach's alpha
1	Responding to customers' uncertainty about their own needs	0.80
2	Adoption of a total acquisition cost approach	0.77
3	Getting feedback from customers	0.79
4	Computer links with customers	0.71
5	Devolution of responsibility for supply chain management to the shop floor	0.71

Table 9.4 Reliability of derived factors

Ensuring content or face validity has been a central part of the design of this study. In order to assess the validity of the summated scales a number of steps were undertaken. The nature of the factors derived was assessed relative to prior research findings. In this respect, the assignment of different forms of customer feedback to two different factors is in agreement with Stuart et al. [1995] who distinguish between feedback systems focusing on assessments of delivery and service and more comprehensive ones, which include assessments of product serviceability and features.

A further test involved comparison of exporters vs. nonexporters with regard to their adoption of a total acquisition cost approach. Research findings [Madsen 1989, Miesenbock 1988, Styles and Ambler 1994] suggest that there is a positive relationship between export performance and a high quality, unique product offering. As Madsen [1989] notes, buyer uncertainty may be a major obstacle for choosing a foreign supplier: high product strength can reduce this uncertainty. It follows, therefore, that exporters may place a greater emphasis on demonstrating the relative advantages of their product offering in order to reduce customer uncertainty. A test was performed to compare exporters and nonexporters in the study sample with regard to this particular characteristic. In order to collect more evidence for the

validity of the remaining scales, and following the recommendations of Hair et al. [1998], comparisons were made to analyses performed with the original variables and factor scores. Exhibit 9.4 illustrates the results of the t-tests performed with the use of the original variables. Exhibit 9.5 illustrates the results of the t-tests performed using the summated scales and the factor scores as replacements for the original variables.

It can be seen from Exhibits 9.4 and 9.5 that the summated scales show the same patterns of differences between exporters vs. nonexporters as either the individual variables or factor scores. They therefore demonstrate some level of convergent validity with the other measures.

In addition to the above, the summated scales correlate very highly with the factor scores as shown in Exhibit 9.6. It can be argued, therefore, that both the factor scores and the summated scales accurately portray the concepts they represent [see Hair et al. 1998].

Exhibit 9.4
Comparison of exporters vs. non-exporters using the original variables

Measure	Mean Scores		t-test
	Group 1: Non-exporters (n=78)	Group 2: Exporters (n=119)	Significance
<i>Original variables</i>			
Computer links for order processing	1.37	1.57	0.201
Computer links for product design	1.36	1.56	0.163
Computer links for production scheduling	1.45	1.42	0.820
Employees' knowledge of customers' processes	3.30	2.83	0.001
Employees manage customer orders	2.30	1.94	0.026
Employees discuss product/process features with customers	2.71	2.34	0.030
Assistance in applications development	3.10	3.32	0.256
Undertake formal product design and development	2.70	2.92	0.283
Influence product design	2.75	3.12	0.049
Customer feedback on product design, performance, features	3.60	3.73	0.429
Education training in product/use	2.06	2.84	0.000
Quantify the impact on customer's performance	3.05	3.47	0.016
Cost savings suggestions	3.00	3.45	0.009
Provide technology forecasts	2.32	2.70	0.020
Customer feedback on quality performance	3.88	4.20	0.024
Customer feedback on delivery performance	4.02	4.00	0.904
Customer feedback on cost	3.78	3.86	0.608

Exhibit 9.5
Comparison of exporters vs. non-exporters using factor scores and summated scales

Measure	Mean scores		t-test
	Group1: Non-exporters (n=78)	Group 2: Exporters (n=119)	Significance
<i>Factor scores</i>			
Factor score 1	-0.15	0.10	0.078
Factor score 2	-0.19	0.16	0.006
Factor score 3	-0.04	0.04	0.575
Factor score 4	-0.01	0.02	0.796
Factor score 5	0.27	-0.18	0.001
<i>Summated scales</i>			
Scale 1	3.05	3.28	0.130
Scale 2	2.61	3.11	0.000
Scale 3	3.90	4.02	0.311
Scale 4	1.41	1.51	0.423
Scale 5	2.77	2.37	0.002

Exhibit 9.6
Correlations between factor scores and summated scales

	Factor score 4	Factor score 5	Factor score 1	Factor score 2	Factor score 3	Scale 1	Scale 2	Scale 3	Scale 4	Scale 5
Factor score 1	0.000	0.000	1.000	0.000	0.000	0.918	0.212	0.189	0.100	0.098
Factor score 2	0.000	0.000	0.000	1.000	0.000	0.223	0.940	0.104	0.083	0.074
Factor score 3	0.000	0.000	0.000	0.000	1.000	0.245	0.097	0.955	0.088	0.060
Factor score 4	1.000	0.000	0.000	0.000	0.000	0.064	0.054	0.094	0.968	-0.057
Factor score 5	0.000	1.000	0.000	0.000	0.000	0.0881	0.076	0.058	-0.056	0.984
Scale 1	0.064	0.088	0.918	0.223	0.245	1.000	0.426	0.432	0.187	0.198
Scale 2	0.054	0.076	0.212	0.940	0.097	0.426	1.000	0.223	0.142	0.157
Scale 3	0.094	0.058	0.189	0.104	0.955	0.432	0.223	1.000	0.209	0.141
Scale 4	0.968	-0.056	0.100	0.083	0.088	0.187	0.142	0.209	1.000	-0.085
Scale 5	-0.057	0.984	0.098	0.074	0.060	0.198	0.157	0.141	-0.085	1.000

9.10 Summary

The use of factor analysis identified the relationship management activities employed by SMMs. It also allowed the derivation of a new set of variables, much smaller in number than the original variables, that can be used in subsequent stages of the analysis -- that is, multiple regression and cluster analysis. The next chapter discusses the multiple regression analyses that were performed.

CHAPTER 10

EMPIRICAL LINKS BETWEEN RELATIONSHIP MANAGEMENT ACTIVITIES, NATURE OF CUSTOMER RELATIONSHIPS AND GROWTH

10.1 Introduction

A set of hypotheses regarding the links between relationship management activities, nature of customer relationships and SMM growth was developed in Chapter 6. This Chapter reports on the details of the multiple regression analysis that was undertaken to test these hypotheses. Results on the combination of factors that influence the nature of customer relationships and ultimately growth, are presented.

10.2 Description of the tested model

Given the degree of interactions between the hypotheses developed in Chapter 6, multiple regression was considered an appropriate method of analysis. Given the exploratory nature of the study, multiple regression will help identify, in the larger set of originally hypothesised influences, those factors that are significant in explaining the study dependent variables [Wacker and Sprague 1998]. It should be emphasised that multiple regression in this study has the aim of identifying significant influences and the direction of these influences rather than to provide predictions.

10.2.1 Description of variables employed in multiple regression analysis

The assumptions underlying multiple regression analysis apply both to the individual variables and to the regression variate. An assessment of compliance with the assumptions of normality, homoscedasticity and linearity will be performed after the variate has been derived. Prior to the analysis, individual variables are examined on a univariate basis in order to assess whether, and to what extent, the assumption of normality is violated.

Table 10.1 provides descriptive statistics for the variables employed in regression analysis (see Appendix B for the complete list of the coded variables).

Variable	Mean	Median	Standard deviation	Skewness	Z _{skewness}	Kurtosis	Z _{kurtosis}
AGE	27.59	20	23.11	2.262	13.3	6.281	18.47
COMP_NO	2.97	3	1.19	0.28	1.62	-0.96	-2.78
CONTRCT1	18.45	5	26.90	1.591	9.16	1.514	4.35
CU_LOC	2.41	2	1.07	0.38	2.20	-1.15	-3.33
CU_ORDER	2.14	2	1.04	0.52	2.6	-0.87	-2.37
CUST_NO	4.22	4	0.85	-.88	-5.10	0.29	0.84
DE_PLCY3	3.36	3	1.14	-0.06	-0.34	-0.89	-2.58
DEPNDNCE	31.76	25	22.52	0.93	5.34	0.17	0.48
EMP_NO	60,29	30	72.45	2.219	13.05	4.973	14.41
FACTOR1	3.18	3.25	1.03	-0.207	-1.2	-0.896	-2.63
FACTOR2	2.89	3	1.02	-0.047	-0.27	-0.707	-2.07
FACTOR3	3.96	4	0.86	-0.5	-2.94	-0.46	-1.35
FACTOR4	1.46	1	0.84	2.051	12.06	3.746	11.01
FACTOR5	2.53	2.33	0.98	0.636	3.74	0.04	0.11
GROWTH	16.47	11	33.82	0.96	5.57	2.15	6.23
INVOICE	56.08	60	19.23	0.30	1.74	1.47	4.26
INVENTORY	1.228	1	0.46	1.79	8.23	3.73	8.58
MC_GRP2	33.38	10	40.78	0.72	3.83	-1.22	-3.24
MKTG1	3.13	3	1.4	-0.12	-0.69	-1.2	-3.48
MKTG2	2.68	2	1.4	0.3	1.74	-1.23	-3.56
MKTG3	3.16	3	1.58	-0.17	-0.98	-1.53	-4.43
MKTG4	3.41	4	1.26	-0.33	-1.91	-0.94	-2.72
MKTG6	3.85	4	1.19	-0.78	-4.52	-0.28	-0.81
PR_CHGE	2.76	3	1.11	-0.41	-2.00	-1.16	-2.84
PR_LINE	2.76	3	1.19	-0.33	-1.91	-1.43	-4.14
RE_SIZE1	3.42	3	1.16	-0.26	-1.50	-0.58	-1.68
RE_SIZE2	4.08	5	1.37	-1.3	-7.54	0.28	0.81
RELPERF	3.62	3.57	0.40	0.01	0.05	0.39	1.14
SALES	19.50	14	30.71	1.15	6.76	1.51	4.44
SCHEDULE	2.97	3	1.01	-0.567	-3.28	0.121	0.35
SUB	0.8	0.5	0.96	1.09	6.41	0.81	2.38
TIME	40.81	40	21.58	0.51	2.95	-0.49	-1.42

Table 10.1 Descriptive statistics of the variables to enter multiple regression analysis

A number of transformations were performed for those variables exhibiting strong departures from normality. These transformations improved the distributions of three variables as indicated in Table 10.2

Variable	Transformation	Skewness	Z _{skewness}	Kurtosis	Z _{kurtosis}
EMP_NO	Log	0.512	3.01	-0.614	1.80
SUB	Log	0.473	2.78	-1.125	3.30
AGE	Log	0.098	0.57	0.319	0.93
DEPNDNCE	Square root	-0.579	3.40	0.238	0.70
INVENTORY	Square root	1.23	5.59	2.078	4.83

Table 10.2 Transformed variables to enter multiple regression analysis

FACTOR4 measures the use of computer links with customers. In the study sample, the use of computer links has been extremely limited. Approximately 70% of the respondents indicated a complete absence of computer links with customers and the remaining indicated very low usage. As a result, FACTOR4 exhibits the patterns of skewness and kurtosis shown in Table 10.1. Given the nature of this variable, and the fact that its role in the study was not judged as critical, it was decided to eliminate it. As a result, hypotheses H₁₃ and H₁₄ regarding the effects of the usage of information technology on the nature of customer relationships will not be tested in this study.

10.2.2 Model equations

The following set of equations represents the relationships illustrated in Exhibit 6.2 (p.6-40).

$$\begin{aligned} \text{CONTRCT1} = & \beta_{10} + \beta_{11}\text{FACTOR1} + \beta_{12} \text{LOGSUB} + \beta_{13} \text{FACTOR5} + \\ & \beta_{14} \text{RELPERF} + \beta_{15}\text{CU_ORDER} + \beta_{16}\text{C_ORDER} + \beta_{17}\text{COMP_NO} + \\ & \beta_{18}\text{RE_SIZE1} + \beta_{19} \text{LOGEMPNO} \end{aligned}$$

(Equation 1)

$$\begin{aligned} \text{TIME} &= \beta_{20} + \beta_{21}\text{FACTOR1} + \beta_{22} \text{LOGSUB} + \beta_{23}\text{RELPERF} + \beta_{24}\text{FACTOR5} \\ &+ \beta_{25}\text{RE_SIZE2} + \beta_{26}\text{COMP_NO} + \beta_{27}\text{CU_LOC} \end{aligned}$$

(Equation 2)

$$\begin{aligned} \text{DE_PLCY3} &= \beta_{30} + \beta_{31}\text{FACTOR1} + \beta_{32}\text{RELPERF} + \beta_{33} \text{LOGSUB} + \beta_{34}\text{FACTOR5} \\ &+ \beta_{35}\text{COMP_NO} + \beta_{36}\text{RE_SIZE2} + \beta_{37}\text{CU_ORDER} + \beta_{38}\text{C_ORDER} \end{aligned}$$

(Equation 3)

$$\begin{aligned} \text{SCHEDULE} &= \beta_{40} + \beta_{41}\text{FACTOR1} + \beta_{42} \text{RELPERF} + \beta_{43} \text{LOGSUB} + \\ &\beta_{44} \text{FACTOR5} + \beta_{45}\text{CU_ORDER} + \beta_{46}\text{C_ORDER} + \beta_{47}\text{RE_SIZE2} + \\ &\beta_{48}\text{PR_TYPE1} + \beta_{49}\text{COMP_NO} \end{aligned}$$

(Equation 4)

$$\begin{aligned} \text{INVOICE} &= \beta_{50} + \beta_{51}\text{FACTOR1} + \beta_{52} \text{RELPERF} + \beta_{53} \text{LOGSUB} + \\ &\beta_{54} \text{FACTOR5} + \beta_{55}\text{CU_ORDER} + \beta_{56}\text{C_ORDER} + \beta_{57}\text{RE_SIZE2} \\ &+ \beta_{58}\text{PR_TYPE1} + \beta_{59}\text{COMP_NO} \end{aligned}$$

(Equation 5)

$$\begin{aligned} \text{CUST_NO} &= \beta_{60} + \beta_{61}\text{FACTOR1} + \beta_{62} \text{LOGSUB} + \beta_{63}\text{RELPERF} + \beta_{64}\text{MKTG1} + \\ &\beta_{65}\text{MKTG2} + \beta_{66}\text{MKTG3} + \beta_{67}\text{MKTG4} + \beta_{68} \text{MKTG6} \end{aligned}$$

(Equation 6)

$$\text{SDEPNDNCE} = \beta_{70} + \beta_{71}\text{CUST_NO}$$

(Equation 7)

$$\begin{aligned} \text{SINVENTORY} &= \beta_{80} + \beta_{81}\text{CONTRCT1} + \beta_{82} \text{TIME} + \beta_{83}\text{DE_PLCY3} + \\ &\beta_{84}\text{SCHEDULE} + \beta_{85} \text{PR_TYPE1} \end{aligned}$$

(Equation 8)

$$\begin{aligned} \text{SALES} = & \beta_{90} + \beta_{91}\text{CONTRCT1} + \beta_{92}\text{TIME} + \beta_{93}\text{CUST_NO} + \beta_{94}\text{SCHEDULE} \\ & + \beta_{95}\text{INVOICE} + \beta_{96}\text{DE_PLCY3} + \beta_{97}\text{MC_GRUP2} + \\ & \beta_{98}\text{MMC_GRUP2} + \beta_{99}\text{PR_CHGE} + \beta_{9,10}\text{MPR_CHGE} + \\ & \beta_{9,11}\text{LOGAGE} \end{aligned}$$

(Equation 9)

$$\begin{aligned} \text{GROWTH} = & \beta_{10,0} + \beta_{10,1}\text{CONTRCT1} + \beta_{10,2}\text{TIME} + \beta_{10,3}\text{CUST_NO} + \\ & \beta_{10,4}\text{SCHEDULE} + \beta_{10,5}\text{INVOICE} + \beta_{10,6}\text{DE_PLCY3} + \\ & \beta_{10,7}\text{MC_GRUP2} + \beta_{10,8}\text{MMC_GRUP2} + \beta_{10,9}\text{PR_CHGE} + \\ & \beta_{10,10}\text{MPR_CHGE} + \beta_{10,11}\text{LOGAGE} \end{aligned}$$

(Equation 10)

As shown in Equations 1 to 10, a number of dummy variables have been included to incorporate nonmetric data in the analysis. These are dichotomous variables, which indicate the presence or absence of the characteristic measured. In particular, the variable C_ORDER measures the presence of a typical customer order size. The variable MMC_GRUP2 incorporates missing data for the percentage of machines organised into cells for products or customers. It was deemed appropriate to include such a variable since this was the characteristic with the relatively greater extent of missing data in the analysis. Finally, MPR_CHGE is a dummy variable used to cater for those business environments in which frequency of changes in the major product line (measured by PR_CHGE) is not applicable, for example, subcontractors.

For parsimonious reasons and in order to avoid increased multicollinearity the following hypotheses were tested using partial correlation analysis: H_{5a}, H_{5b}, H_{6a}, H_{6b}, H_{6c}, H_{8a}, H_{8b}, H_{9a}, H_{9b}, H_{9c}, H_{18e}, H₂₁ (see Chapter 6). Partial correlation analysis allows for examination of the association between two variables while controlling for the effect of a common influence.

In terms of marketing activities, MKTG2 (“participation in trade shows, and advertisements in trade journals”) is highly correlated with MKTG5 measuring the “use of Internet for getting new customers” (0.36 significant at $p = 0.000$). Given the

recent emphasis on the use of the Internet for marketing purposes, it is sound to assume that companies aiming at a large market coverage through the use of marketing tools such as participation in trade shows and advertisements in trade journals are more likely to have recently adopted the Internet as a convenient medium. Therefore, the effect of MKTG5 on the size of the customer base (hypothesis H_{10e}) was examined through the use of partial correlation analysis.

10.2.3 Sample size and power of the analysis

The sample size of 202 observations exceeds by far the minimum requirement for a ratio of observations to independent variables of 5 to 1. In fact, the ratio is in the range of 15 to 20 for all equations. At this level, results should be generalisable if the sample is representative of the population.

The statistical power of the analysis is becoming increasingly important as empirical studies in Production and Operations Management study relatively smaller effects [Verma and Goodale 1995]. A power analysis for R^2 was performed following the methodology recommended by Cohen and Cohen [1983]. The power of the test can be assessed by using the following formula:

$$n = \frac{L}{f^2} + k + 1 \quad (\text{Equation 11})$$

where:

n = sample size

L = tabulated values that provide for various levels of power

k = number of independent variables

f^2 = population effect size

The population effect size for R^2 is given by:

$$f^2 = \frac{R^2}{1 - R^2} \quad (\text{Equation 12})$$

Estimates for the population size may include indications from previous work, a minimum value that would be of theoretical or practical significance, or some other conventional value. Previous studies on supply chain relationships and studies of SMEs were reviewed [Bensaou and Venkatraman 1995, Wijewardena and Tibbits 1998, Birley and Westhead 1990, Lieberman et al. 1998]. This review showed that explanatory power suggested by values in the range of 0.10 to 0.15 for R^2 was commonly encountered in models dealing with aspects of supply chain relationships and/or SME growth.

Using this value for R^2 it is possible to estimate the effect size from Equation 12 as $f^2 = 0.176$. The sample size is 202 cases and as shown in Equations 1 to 10, regression models do not have more than 11 independent variables. From Equation 11, for a sample of 202 cases and $k=11$, the L value is found 33.44. Using a significance level of $\alpha=0.01$, and the L tables given by Cohen and Cohen [1983], it can be seen that the models described by Equations 1 to 10, have a power of 0.96 for detecting R^2 values as small as 0.15. For $R^2 = 0.10$, similar calculations indicate a statistical power of 0.80, which represents a reasonable and realistic value for research in social/behavioural sciences [Veram and Goodale 1995]. The high levels of statistical power achieved are of great significance in that they ensure the ability of the statistical tests to detect significant relationships among variables and support the repeatability of the present study.

10.2.4 Regression method

Stepwise estimation was used to estimate the model outlined by Equations 1 to 10. This is perhaps the most popular sequential method used [Hair et al. 1998]. A potential problem in stepwise estimation is the existence of increased multicollinearity, which may mask significant relationships. All bivariate correlations of the study variables were examined and partial correlation analysis was used in cases where an increased danger of multicollinearity could potentially exist. It was ensured therefore that multicollinearity is not a problem for this study. The model was also estimated using a second estimation method. In particular the ENTER method, which is available in SPSS, was used. Contrary to sequential methods, in this method,

all variables forming a block enter the equation simultaneously. The application of this method produced identical results with the stepwise estimation thus increasing confidence in the validity of the model.

All regression models were examined for meeting the assumptions underlying multiple regression analysis, namely, linearity, homoscedasticity, and normality. This examination identified some slight departures, which do not pose any problems for the robustness of the models as well as some moderate departures. In these cases, additional checks were made, where possible, to ensure robustness; these were satisfactory. Furthermore influential observations were identified and regressions were performed after eliminating them. In all cases but one, results were identical -- the exception was the deterioration of the significance level of variable FACTOR3 Equation 1. In most cases, the elimination of influential observations led to an increase in the explanatory power of the models as indicated by the increase in the values of R^2 adjusted. After examining influential observations one-by-one, no theoretical grounds were established to justify the exclusion of these cases from the analysis. Following recommendations by Hair et al. [1998] it was decided to retain these cases in the analysis to increase representativeness of the sample. A detailed description of the checks made on the assumptions of multiple regression analysis as well as the analysis of influential observations can be found in Appendix I.

10.3 Results of multiple regression analysis and partial correlation analysis.

Exhibit 10.1 summarises the results of the multiple regression analysis. R^2 and R^2 adjusted values, standardised coefficients and significance levels are reported. The explanatory power of the equations -- typically in the range of 0.10 to 0.22 -- is quite comparable with previous studies in the area of supply chain relationships and/or SMM growth.

Exhibit 10.2 summarises the results of the partial correlation analysis.

Exhibit 10.1

Results of multiple regression analysis

Dependent variables : CONTRCT1, TIME						
Dependent variable	Hypothesised influences	Hypothesis Tested	Estimated Coefficients (standardised)	p-value	R ²	R ² adj
CONTRCT1	FACTOR1	H _{1a}	β ₁₁ = 0.17	0.0072	0.227	0.211
	LOGSUB	H _{3a}	β ₁₂ = 0.13	0.0387		
	FACTOR5	H _{11a}	β ₁₃ = 0.13	0.0664		
	RELPERF	H _{15a}	β ₁₄ = -0.04	0.4946		
	CU_ORDER	H ₃₆	β ₁₅ = 0.24	0.0002		
	C_ORDER	H ₃₆	β ₁₆ = 0.00	0.9102		
	COMP_NO	H _{34a}	β ₁₇ = -0.01	0.8631		
	RE_SIZE1	H _{33a}	β ₁₈ = 0.04	0.4781		
	LOGEMPNO	H ₂₉	β ₁₉ = 0.27	0.0000		
	FACTOR1	H _{11b}	β ₂₁ = 0.31	0.0000		
	LOGSUB	H _{3b}	β ₂₂ = -0.06	0.3468		
	RELPERF	H _{15b}	β ₂₃ = -0.02	0.6644		
	FACTOR5	H _{11b}	β ₂₄ = 0.06	0.3726		
	RE_SIZE2	H ₃₁	β ₂₅ = 0.07	0.2777		
	COMP_NO	H _{34b}	β ₂₆ = -0.08	0.1937		
	CU_LOC	H ₃₀	β ₂₇ = 0.07	0.2612		
TIME					0.100	0.096

Results of multiple regression analysis (continued)

Dependent variables : DE_PLCY3, SCHEDULE						
Dependent variable	Hypothesised influences	Hypothesis Tested	Estimated Coefficients (standardised)	p-value	R ²	R ² adj
DE_PLCY3	FACTOR1	H _{2a}	β ₃₁ = 0.20	0.0042	0.040	0.035
	RELPERF	H _{16a}	β ₃₂ = 0.04	0.5417		
	LOGSUB	H _{4a}	β ₃₃ = 0.03	0.6751		
	FACTOR5	H _{12a}	β ₃₄ = 0.10	0.1473		
	COMP_NO	H _{35a}	β ₃₅ = 0.03	0.6751		
	RE_SIZE2	H _{32a}	β ₃₆ = -0.01	0.7831		
	CU_ORDER	H _{37a}	β ₃₇ = -0.02	0.7571		
	C_ORDER	H _{37a}	β ₃₈ = -0.09	0.1753		
	FACTOR1	H _{2b}	β ₄₁ = 0.10	0.1523		0.148
	RELPERF	H _{16b}	β ₄₂ = 0.01	0.8577		
	LOGSUB	H _{4b}	β ₄₃ = 0.20 *	0.0028		
	FACTOR5	H _{12b}	β ₄₄ = 0.01	0.8643		
	CU_ORDER	H _{37b}	β ₄₅ = 0.14	0.0335		
	C_ORDER	H _{37b}	β ₄₆ = 0.04	0.4637		
SCHEDULE	RE_SIZE2	H _{33b}	β ₄₇ = 0.09	0.1505		
	PR_TYPE1	H ₃₈	β ₄₈ = 0.18	0.0087		
	COMP_NO	H _{35b}	β ₄₉ = 0.14	0.0418		

* H_{2d} is in the opposite direction from the one hypothesised

Results of multiple regression analysis (continued)

Dependent variables: CUST_NO, SDEPNDNCE, SINVENTRY						
Dependent variable	Hypothesised influences	Hypothesis Tested	Estimated Coefficients (standardised)	p-value	R ²	R ² adj
CUST_NO	FACTOR1	H ₁₉	β ₆₁ = -0.25	0.0001	0.157	0.145
	LOGSUB	H ₂₀	β ₆₂ = -0.08	0.2239		
	RELPERF	H ₁₇	β ₆₃ = 0.06	0.3698		
	MKTG1	H _{18a}	β ₆₄ = 0.00	0.9548		
	MKTG2	H _{18b}	β ₆₅ = 0.21	0.0027		
	MKTG3	H _{18c}	β ₆₆ = 0.19	0.0063		
	MKTG4	H _{18d}	β ₆₇ = -0.04	0.4585		
	MKTG6	H _{18f}	β ₆₈ = 0.01	0.8710		
	CUST_NO	H ₂₂	β ₇₁ = -0.45	0.0000		
	CONTRCT1	H _{26a}	β ₈₁ = -0.21	0.0111		
	TIME	H _{26b}	β ₈₂ = 0.06	0.4182		
	DE_PLCY3	H _{27b}	β ₈₃ = -0.02	0.7397		
	SCHEDULE	H _{27a}	β ₈₄ = 0.01	0.9173		
	PR_TYPE1	H ₃₉	β ₈₅ = -0.34	0.0001		
SDEPNDNCE					0.203	0.199
SINVENTRY					0.184	0.171

Results of multiple regression analysis (concluded)

SALES, GROWTH					
Dependent variable	Hypothesised influences	Hypothesis Tested	Estimated Coefficients (standardised)	p-value	R ² R ² adj
SALES	CONTRCT1	H _{23a}	β ₉₁ = 0.17	0.0188	0.1300.116
	TIME	H _{23b}	β ₉₂ = -0.02	0.7186	
	CUST_NO	H ₂₄	β ₉₃ = 0.05	0.4459	
	SCHEDULE	H _{25a}	β ₉₄ = 0.03	0.5713	
	DE_PLCY3	H _{25b}	β ₉₅ = -0.02	0.6695	
	INVOICE	H _{25c}	β ₉₆ = 0.02	0.7041	
	MC_GRP2	H _{28b}	β ₉₇ = 0.18	0.0102	
	MMC_GRP2	H _{28b}	β ₉₈ = 0.04	0.5318	
	PR_CHGE	H _{28a}	β ₉₉ = -0.21	0.0024	
	MPR_CHGE	H _{28a}	β _{9,10} = 0.00	0.9639	
	LOGAGE	H ₄₀	β _{9,11} = -0.08	0.2374	
	CONTRCT1	H _{23a}	β _{10,1} = 0.14	0.0434	
	TIME	H _{23b}	β _{10,2} = -0.08	0.2298	
	CUST_NO	H ₂₄	β _{10,3} = -0.00	0.9921	
GROWTH	SCHEDULE	H _{25a}	β _{10,4} = -0.00	0.9518	0.1100.097
	DE_PLCY3	H _{25b}	β _{10,5} = -0.02	0.7433	
	INVOICE	H _{25c}	β _{10,6} = -0.05	0.4070	
	MC_GRP2	H _{28b}	β _{10,7} = 0.08	0.2145	
	MMC_GRP2	H _{28b}	β _{10,8} = 0.08	0.2340	
	PR_CHGE	H _{28a}	β _{10,9} = -0.14	0.0397	
	MPR_CHGE	H _{28a}	β _{10,10} = 0.013	0.8472	
	LOGAGE	H ₄₀	β _{10,11} = -0.25	0.0002	

Exhibit 10.2

Results of partial correlation analysis

Correlation pair	Control variable	Hypothesis tested	Partial correlation coefficient	p value
FACTOR5 and CONTRCT1	LOGEMPNO	Ex facto	0.151	0.033*
FACTOR2 and CONTRCT1	FACTOR1	H _{5a}	0.001	0.982
FACTOR2 and TIME	FACTOR1	H _{5b}	0.003	0.965
FACTOR2 and DE_PLCY3	FACTOR1	H _{6a}	0.034	0.634
FACTOR2 and SCHEDULE	FACTOR1	H _{6b}	-0.052	0.465
FACTOR2 and INVOICE	FACTOR1	H _{6c}	-0.032	0.645
FACTOR3 and CONTRCT1	FACTOR1	H _{8a}	0.146	0.039*
FACTOR3 and TIME	FACTOR1	H _{8b}	0.095	0.188
FACTOR3 and DE_PLCY3	FACTOR1	H _{9a}	0.128	0.071
FACTOR3 and SCHEDULE	FACTOR1	H _{9b}	0.107	0.136
FACTOR3 and INVOICE	FACTOR1	H _{9c}	-0.100	0.155
MKTG5 and CUST_NO	MKTG2	H _{18e}	0.111	0.116
CUST_NO and CONTRCT1	FACTOR1, LOGSUB	H ₂₁	-0.274	0.000**

* significant at $p=0.05$

** significant at $p=0.01$

The results from multiple regression and partial correlation analysis provide overall good support for the relationships hypothesised in this study. An overview is provided in Exhibit 10.3. A brief summary of the results follows below:

- Those SMMs who are solution providers and those who develop their product/service offering with a view to increase their own share of value added in the supply chain have a higher percentage of their sales covered by long-term contracts.
- More extensive devolution of supply chain responsibility to the shop floor is associated with a higher percentage of sales covered by long-term contracts. The size of the SMM (in terms of number of employees) is negatively associated with this activity.
- Getting feedback from customers on quality, delivery performance and cost is positively associated with long-term contracts. Feedback is also associated – although weakly – with using negotiations to determine delivery policies.
- The absolute SMM size as well as the size of customer requirements play a role in the extent to which SMMs have long-term contracts with customers.
- SMMs who are solution providers and devolve supply chain responsibility to the shop floor spend more time with their customers on coordination tasks relative to control tasks. Results also suggest that SMMs who are solution providers more often determine delivery policies with customers through negotiation.
- Custom products favour less stable customer schedules. Products that involve a higher share of value added in the supply chain for SMMs are also associated with less stable schedules. Moreover, market characteristics appear to adversely affect stability of schedules. The number of SMM's competitors and its size relative to its major customers are positively associated with less stable schedules. Finally, larger customer order sizes are associated with less stable schedules.

Exhibit 10.3
Support for the research hypotheses

Hypothesis	Result	Significance level
H _{1a}	Supported	0.01
H _{1b}	Supported	0.05
H _{2a}	Supported	0.01
H _{2b}	Not supported	
H _{2c}	Not supported	
H _{3a}	Supported	0.05
H _{3b}	Not supported	
H _{4a}	Not supported	
H _{4b}	Supported in the opposite direction	0.01
H _{4c}	Not supported	
H _{5a}	Not supported	
H _{5b}	Not supported	
H _{6a}	Not supported	
H _{6b}	Not supported	
H _{6c}	Not supported	
H ₇	Supported	0.01
H _{8a}	Supported	0.05
H _{8b}	Not supported	
H _{9a}	Supported	0.10
H _{9b}	Not supported	
H _{9c}	Not supported	
H ₁₀	Supported	0.01
H _{11a}	Supported	0.05
H _{11b}	Not supported	
H _{12a}	Not supported	
H _{12b}	Not supported	
H _{12c}	Not supported	
H _{13a}	Not tested	
H _{13b}	Not tested	

Support for the research hypotheses (continued)

Hypothesis	Result	Significance level
H _{14a}	Not tested	
H _{14b}	Not tested	
H _{14c}	Not tested	
H _{15a}	Not supported	
H _{15b}	Not supported	
H _{16a}	Not supported	
H _{16b}	Not supported	
H _{16c}	Not supported	
H ₁₇	Not supported	
H _{18a}	Not supported	
H _{18b}	Supported	0.01
H _{18c}	Supported	0.01
H _{18d}	Not supported	
H _{18e}	Not supported	
H _{18f}	Not supported	
H ₁₉	Supported	0.01
H ₂₀	Not supported	
H ₂₁	Supported	0.01
H ₂₂	Supported	0.01
H _{23a}	Supported	0.05
H _{23b}	Not supported	
H ₂₄	Not supported	
H _{25a}	Not supported	
H _{25b}	Not supported	
H _{25c}	Not supported	
H _{26a}	Supported	0.05
H _{26b}	Not supported	
H _{27a}	Not supported	
H _{27b}	Not supported	

Support for the research hypotheses (concluded)

Hypothesis	Result	Significance level
H _{28a}	Supported	0.01 (SALES), 0.05 (GROWTH)
H _{28b}	Partly supported	0.05 (SALES)
H ₂₉	Supported	0.01
H ₃₀	Not supported	
H ₃₁	Not supported	
H _{32a}	Not supported	
H _{32b}	Not supported	
H _{33a}	Not supported	
H _{33b}	Not supported	
H _{34a}	Not supported	
H _{34b}	Not supported	
H _{35a}	Not supported	
H _{35b}	Supported	0.05
H _{35c}	Not supported	
H ₃₆	Supported	0.01
H _{37a}	Not supported	
H _{37b}	Supported	0.01
H _{37c}	Not supported	
H ₃₈	Supported	0.01
H ₃₉	Supported	0.01
H ₄₀	Partly supported	0.01 (GROWTH)

- SMMs who are solution providers and develop their product/service offering with a view to increasing their own share of value added in the supply chain, tend to work with fewer customers. They also exhibit higher levels of dependence on a small set of customers.
- In terms of marketing activities, participation in trade shows, advertisements in trade journals, and salespersons' calls are associated with larger customer bases, and less dependence on a small set of customers. In contrast, direct mail, phone calls, top management involvement and word of mouth do not have any effect on the size of the customer base.
- Working on the basis of long-term contracts *per se* is associated with smaller customer bases.
- SMMs who have a higher percentage of contracts have a lower ratio of production to delivery batch size, thus indicating that they maintain less inventory. Not surprisingly, the nature of products has an effect on inventory levels; SMMs who tailor their products to a customer's specific request also have a lower ratio of production to delivery batch size.
- Contracts are associated with higher levels of sales and employment growth. Organisation of production into cells for products or customers also has a positive effect on sales growth. On the other hand, the frequency of major changes in the product range has a negative effect on sales and employment growth.

10.4 Summary

Multiple regression analysis was performed to test the hypothesised relationships between relationship management activities, characteristics of customer relationships and SMM growth. This provided an insight into the combination of factors that influence customer relationships and SMM growth. The next chapter combines the study findings so far in order to propose a relationship-oriented classification of SMMs.

CHAPTER 11

RELATIONSHIP-ORIENTED CLASSIFICATION OF SMMs

11.1 Introduction

The use of multiple regression analysis in Chapter 10 provided useful insights into the combination of factors that affect the nature of customer relationships and SMM growth. This chapter builds on the findings of previous stages of analysis to uncover naturally occurring patterns of SMM behaviour with regard to customer relationships. Cluster analysis is used to empirically derive types of SMMs based on the relationship management and marketing activities they implement and the characteristics of their customer relationships. The final stage of analysis involves comparing the empirically derived types in terms of their growth potential.

11.2 Conceptual background for the derivation of SMM types

The application of multiple regression analysis led to identification of significant influences on the nature of customer relationships and SMM growth in the context illustrated by the tested model in Figure 6.1. Multiple regression analysis provided useful insights into the combination of factors that affect the nature of customer relationships and, ultimately, growth. There is, however, in multiple regression an inherent assumption of linearity – that all firms conform to the described patterns sequentially. In order to investigate how individual relationship management activities combine with particular customer relationship characteristics to realistically represent SMMs in supply chains, the study attempted to produce a classification of SMM “types”.

Research adopting a classification approach falls into two major streams [Bensaou and Venkatraman 1993] – testing typologies and uncovering taxonomies. The former attempts to empirically verify conceptual typologies while the latter seeks to empirically uncover a set of configurations within a given dataset. Table 11.1 contrasts these approaches:

Distinctive Characteristics	Testing Typologies	Uncovering Taxonomies
Major advantages	Theory-driven, hence results can be assessed against <i>a priori</i> specifications	Naturally occurring patterns may be uncovered that might shed light on the limits of extant theories
Disadvantages	Empirical results that refute the theoretical specification may not be powerful enough to highlight any inherent weaknesses in the integrity of the typology	No underlying theory or conceptual model to guide the selection of variables
Theoretical assumptions	Typology is mutually exclusive and collectively exhaustive	Taxonomies are casually interpreted in light of a conveniently available set of theories
Methodological assumptions	Methodology is assumed to be in line with the theoretical typology	Stability of the configurations: configurations are not an artifact of the chosen analytical method

Source: Bensaou and Venkatraman, 1993

Table 11.1 Extant Research: Tests of Typologies vs. Uncovering Taxonomies

Adopting the approach used by Bensaou and Venkatraman [1993], the objective of this study is to integrate the two approaches in order to maximise the advantages and minimise the disadvantages of the typologies and the taxonomies. To this end, the study brought together different research streams -- supply chain management, industrial marketing and the literature on factors affecting growth – to develop a conceptual model of SMMs’ relationships with customers in their supply chains. Semi-structured interviews and factor analysis were used to derive valid and reliable measures of the concepts employed. Multiple regression analysis helped in identifying combinations of significant factors in the model – namely, the relationship management activities affecting the nature of customer relationships and the particular relationship characteristics affecting SMM growth. Cluster analysis can now use these factors as a basis to empirically derive a set of naturally occurring types of SMMs in terms of their customer relationships.

11.3 The application of cluster analysis

The following sections describe the steps undertaken for the application of cluster analysis to uncover naturally occurring patterns of SMM behaviour with regard to customer relationships.

11.3.1 Selection of variables to enter cluster analysis

Variable selection is of fundamental concern in cluster analysis. This selection must be done with regard to theoretical and conceptual as well as practical considerations. The objective of the application of cluster analysis in this study is to empirically derive a typology of SMMs that can describe their behaviour in supply chains with regard to their customer relationships. The study as a whole has viewed SMMs as active parts of the supply chains in which they operate, and has subsequently focused on the activities that they can undertake in order to influence critical dimensions of their customer relationships and, ultimately, growth. In this context, relationship management activities employed by SMMs and critical dimensions of their customer relationships are prime candidates for inclusion in the cluster analysis.

The hypothesised influences of relationship management activities and marketing activities on the nature of customer relationships, in conjunction with the results of multiple regression analysis, are used to provide guidance into the selection of the particular variables to enter cluster analysis. Multiple regression analysis showed that responding to customer uncertainty for own needs and increasing own share of value added in the supply chain have a significant effect on the nature of customer relationships. It was also found that an intensive marketing effort in contacting customers both in terms of depth (e.g., personal sales calls) and breadth (e.g., participation in trade shows, advertisements in trade journals) have a significant effect on the structure of the customer base. Customer commitment in terms of long-term contracts, as well as characteristics of the customer base structure in terms of size and dependence, are critical dimensions from the theoretical point of view that the study has adopted as well as the semi-structured interviews with SMMs. They also emerged as significant dimensions from the multiple regression analysis. The nature of the

SMM’s products was also included in the cluster analysis as it was felt that it significantly shapes the environment in which customer relationships develop.

Table 11.2 describes the variables entered in the cluster analysis.

Variable number	Variable name	Variable description
1	FACTOR1	Responding to customer uncertainty for own needs
2	SUB	Increase own share of value added in the supply chain
3	MKTG2	Marketing tool: participation in trade shows, advertisements in trade journals
4	MKTG3	Marketing tool: salespeoples’ calls on customers
5	CONTRCT1	Percent of sales covered by long-term contracts
6	CUST_NO	Number of customers
7	DEPNDNCE	Dependence on customers
8	PR_TYPE1	Percent of products tailor-made to a customer’s request
9	PR_TYPE2	Percent of products MTO from a catalogue or a standard product listing
10	PR_TYPE3	Percent of products MTS

Table 11.2 Variables to enter cluster analysis

11.3.2 Assessment of compliance with the assumptions of cluster analysis

Descriptive statistics for the variables to enter cluster analysis have been presented in Tables 9.1 and 10.1. The requirements of normality, linearity, and homoscedasticity have little bearing on cluster analysis since it is not a statistical inference technique. The most important assumptions refer to the representativeness of the sample and the impact of multicollinearity [Hair et al. 1998].

This study has performed an assessment of the existence of outliers in the sample in the univariate and multivariate cases and in the context of the multiple regression analysis undertaken. In all cases, the decision to retain such observations was reached, based on the ground that no theoretical reasons existed to suggest their elimination. Outliers may really be only an undersampling of divergent groups that, when discarded, introduce bias in the estimation of the structure [Hair et al. 1998]. The inclusion of such observations in the analysis provides an assurance that the resulting structure is unbiased.

Any potential dangers due to multicollinearity are eliminated through selection of the particular variables to enter cluster analysis. Responding to customer uncertainty for own need (FACTOR1) enters the analysis as a central relationship management activity while activities highly correlated with FACTOR1, that is, adopting a total acquisition cost approach (FACTOR2) and getting feedback from customers (FACTOR3) are left out.

11.3.3 Choice of the clustering method

There are two categories of methods available for cluster analysis, and each has advantages and disadvantages. Hierarchical methods can be misleading, because undesirable early combinations may persist throughout the analysis and lead to artificial results. Nonhierarchical methods are less susceptible to outliers and the inclusion of irrelevant variables. Their use, however, depends on the ability of the researcher to select the seed points according to some practical, objective, or theoretical basis [Hair et al. 1998].

Following the recommendations by Hair et al. [1998], both hierarchical and nonhierarchical methods were employed in the analysis to gain the benefits of each.

Ward’s method of clustering was initially employed for the analysis. This is the most common hierarchical method [Hair et al. 1998, Bensaou and Venkatraman 1993]. The squared Euclidean distance is chosen as the similarity measure: this is the recommended distance measure for Ward’s method of clustering. Data are standardised since variables are measured on different scales. A nonhierarchical method of clustering is also employed, using the cluster centres from the hierarchical results as the initial seed points.

11.3.4 Determining the number of clusters to form

No standard, objective procedure exists to determine the number of clusters to form. The agglomeration coefficient is used as an initial guide for determining the number of clusters to form. This criterion has the tendency to show too few clusters [Hair et al. 1998]. In order to identify large relative increases in the cluster homogeneity, the percentage change in the clustering coefficient for 8 to 2 clusters is calculated. The results are shown in Table 11.3.

Number of clusters	Agglomeration coefficient	Percentage change in coefficient to next level
8	970.1	5.2
7	1021.6	6.0
6	1083.2	9.0
5	1181.9	9.3
4	1292.6	12.4
3	1453.9	12.6
2	1637.3	22.7
1	2010.0	—

Table 11.3 Analysis of agglomeration coefficient for hierarchical cluster analysis

As shown in Table 11.3, the largest percentage increase occurs in combining two to one clusters and four to three clusters. Considering the four-cluster solution as an initial guide, a five-cluster solution was also examined given that the agglomeration coefficient tends to show too few clusters. The final judgement on the number of clusters to form is based on theoretical foundations that may suggest a natural number of clusters. An examination of the four-cluster and five-cluster solutions suggests that both reflect the combinations of factors that multiple regression analysis identified as significant ones. The five-cluster solution, however, suggests a more in-depth structure that is supported by the study findings from the semi-structured interviews with SMMs, and the major theoretical proposition of developing a balanced portfolio of customer relationships. As a result, the five-cluster solution is adopted.

11.3.5 Profile of the five-cluster solution

Exhibit 11.1 contains the profiles of the clustering variables for the five-cluster solution using Ward's method with squared Euclidean distance as the similarity measure (hierarchical analysis). As discussed in Section 11.3.3, nonhierarchical cluster analysis was also performed. For this analysis, the cluster centres from the hierarchical procedure were used as initial seed points. As in the case of hierarchical analysis, standardised values are used since variables are measured on different scales. Exhibit 11.2 shows the standardised values for the initial and final cluster centres from the non-hierarchical analysis. Exhibit 11.3 contains the profiles of the clustering variables for the solution obtained through nonhierarhical analysis.

The cluster solutions obtained from both the hierarchical and non-hierarchical analyses, discriminate between SMM types. Exhibits 11.4 and 11.5 show significant differences between cluster centres from the hierarchical and nonhierarchical analyses.

The comparison of the clusters formed with the use of hierarchical and nonhierarchical clustering methods shows that the two solutions are quite similar in terms of cluster sizes and cluster centres (see Exhibits 11.1 and 11.3). All variables show significant differences between the clusters for both methods (see Exhibits 11.4

and 11.5). The correspondence and stability of the solutions between the two methods confirms the results of the analysis provided that the clusters pass the test of theoretical and practical acceptance. These issues are discussed in the following sections.

Exhibit 11.1

Clustering variable profiles for the five-cluster solution from the hierarchical analysis

Clustering Variable Mean Values											
Cluster	CONTRCT1	CUST_NO	DEPDNCE	FACTOR1	MKTG2	MKTG3	PR_TYPE1	PR_TYPE2	PR_TYPE3	SUB	Cluster size
1	9.05	4.60	20.90	2.89	3.20	3.32	11.58	81.01	7.40	0.45	40
2	29.15	3.64	55.05	3.56	1.72	1.78	88.50	8.40	3.10	1.36	51
3	13.84	4.25	27.92	2.44	2.00	3.27	94.95	2.87	2.17	0.25	40
4	5.70	4.72	19.32	2.73	3.04	3.68	12.88	7.88	79.24	0.56	25
5	25.08	4.23	25.29	3.90	3.61	4.13	73.00	21.19	5.58	1.08	46

Exhibit 11.2

Final cluster centres from the non-hierarchical analysis (standardised values)

Non-hierarchical cluster analysis : Initial cluster centres												
Cluster	CONTRCT1	CUST_NO	DEPDNCE	FACTOR1	MKTG2	MKTG3	PR_TYPE1	PR_TYPE2	PR_TYPE3	SUB		
1	-0.3432	0.4429	-0.4800	-0.2822	0.3866	0.1096	-1.2470	1.6971	-0.2350	-0.3658		
2	0.4011	-0.6741	1.0429	0.3694	-0.6758	-0.8749	0.6604	-0.4783	-0.3849	0.5738		
3	-0.1681	0.0307	-0.1725	-0.7168	-0.4780	0.7760	0.8347	-0.6541	-0.4265	-0.5539		
4	-0.4581	0.5842	-0.5635	-0.4339	0.2713	0.3364	-1.2148	-0.5035	2.3986	-0.2508		
5	0.2488	0.0179	-0.2825	0.6950	0.6811	0.6242	0.2865	-0.1028	-0.3014	0.2999		

Non-hierarchical cluster analysis : Final cluster centres												
Cluster	CONTRCT1	CUST_NO	DEPDNCE	FACTOR1	MKTG2	MKTG3	PR_TYPE1	PR_TYPE2	PR_TYPE3	SUB		
1	-0.2089	0.4654	-0.5181	-0.3119	0.3455	0.2062	-1.2591	1.7150	-0.2392	-0.3384		
2	0.3789	-0.7962	0.9472	0.3498	-0.7561	-0.8380	0.6855	-0.4849	-0.4138	0.2787		
3	-0.2192	0.1943	-0.3323	-0.8235	-0.4380	0.2569	0.7895	-0.6487	-0.3668	-0.4645		
4	-0.4949	0.6068	-0.5702	-0.4876	0.3366	0.2631	-1.2737	-0.5353	2.5238	-0.3817		
5	0.1467	0.1111	-0.1626	0.7732	0.8321	0.5409	0.3337	-0.1984	-0.2547	0.5416		

Exhibit 11.3

Clustering variable profiles for the five-cluster solution from the nonhierarchical analysis

Clustering Variable Mean Values												
Cluster	CONTRCT1	CUST_NO	DEPNDNCE	FACTOR1	MKTG2	MKTG3	PR_TYPE1	PR_TYPE2	PR_TYPE3	SUB	Cluster size	
1	12.87	4.61	20.33	2.86	3.14	1.84	11.10	81.60	7.28	0.43	42	42
2	28.56	3.54	52.92	3.54	1.61	3.47	88.97	8.50	2.52	1.31	57	57
3	12.59	4.38	24.46	2.33	2.05	3.55	93.13	3.05	3.80	0.35	36	36
4	5.23	4.73	19.17	2.68	3.13	3.56	10.52	6.82	82.65	0.47	23	23
5	22.36	4.31	28.24	3.98	3.81	4.00	74.88	18.02	6.86	1.06	44	44

Exhibit 11.4

Significance testing of differences between cluster centres from hierarchical analysis

Variable	F ratio	Significance
CONTRCT1	6.1177	0.0001
CUST_NO	12.2029	0.0000
DEPNDNCE	30.5506	0.0000
FACTOR1	19.7975	0.0000
MKTG2	21.7630	0.0000
MKTG3	21.2165	0.0000
PR_TYPE1	158.0958	0.0000
PR_TYPE2	148.2006	0.0000
PR_TYPE3	226.2516	0.0000
SUB	12.4085	0.0000

Exhibit 11.5

Significance testing of differences between cluster centres from nonhierarchical analysis

Variable	F ratio	Significance
CONTRCT1	4.9410	0.0008
CUST_NO	18.8343	0.0000
DEPNDNCE	29.3347	0.0000
FACTOR1	24.7585	0.0000
MKTG2	30.9584	0.0000
MKTG3	20.2945	0.0000
PR_TYPE1	181.0632	0.0000
PR_TYPE2	194.6054	0.0000
PR_TYPE3	236.4975	0.0000
SUB	9.7668	0.0000

11.4 Interpretation of the clusters

Five distinctive patterns of SMM behaviour in relation to customer relationships emerge from application of cluster analysis. This section provides an interpretation of the clusters based on the values of cluster centres and the testing of significant differences among clusters on the clustering variables.

Cluster 1: The MTO Standardisers

This cluster comprises SMMs who manufacture predominantly to customer order from a catalogue or a standard product listing. They focus on providing products to customers rather than responding to customer uncertainty for own needs, or increasing their own share of value added in the supply chains they operate. They maintain large customer bases through intensive marketing efforts in terms of participation in trade shows, advertisements in trade journals and personal sales calls on customers. They work predominantly on the basis of individual orders and exhibit very low levels of dependence from customers.

Cluster 2 - The Captives

This cluster comprises SMMs who tailor their products to a customer's specific request. They are in the business of providing solutions to customers rather than simply providing a product. They also try to develop their product/service offering in a vertical sense, by increasing their share of value added in the supply chains they operate. Their resources are committed to serving few customers and they work to a large extent on long-term contracts. They are not active in marketing their products/services. As a result, they maintain smaller customer bases and exhibit higher levels of dependence from customers than any other SMM type.

Cluster 3 -The Satellites

This cluster also comprises SMMs who -- like the Captives -- tailor their products to a customer's specific request. They, however, work predominantly on customer specifications without providing solutions or expertise to them. Their influence in terms of value added in the supply chains they operate is also very limited. They too -- again like the Captives -- are not active in marketing their products/services. They

work on the basis of individual orders. Their focus on particular jobs allows them to serve larger customer bases and exhibit lower levels of dependence than the Captives.

Cluster 4 - The MTS Standardisers

This cluster comprises SMMs who manufacture to stock without a specific customer order. Apart from this, they exhibit the same behaviour as SMMs who are MTO Standardisers. As manufacturers of standard products, they focus on the actual transactions rather than on providing solutions to customers or increasing their own share of value added in the supply chains they operate. Like the MTO Standardisers, they maintain large customer bases and are active in marketing their products trying to reach large customer audiences. They work predominantly on the basis of individual orders and exhibit very low levels of dependence from customers.

Cluster 5 - The Managers

These are SMMs who mainly tailor their products to a customer's specific request. They do, however, manufacture a considerable proportion of their product range to customer order from a catalogue or a standard product listing, thus indicating the existence of a strategy to develop an organisation geared to respond to a structured set of customer requirements. This is further supported by the fact that the Managers, while accommodating specific customer requests like the Captives and the Satellites, have their production organised into cells for product or customers to a larger extent than the latter. Managers are, like the Captives, in the business of providing solutions to customers rather than simply products, and they too seek to increase their own share of value added in the supply chains they operate. They also have a significant proportion of their turnover covered by long-term contracts. The nature of their business implies that they focus on serving the needs of fewer customers than the MTS and MTO Standardisers. Unlike the Captives however, they are active in marketing their products/services. As a result, they have more customers and lower levels of dependence than the Captives, thus indicating that they spread their business more evenly among their customers.

11.5 Validation of the clusters

Application of both the hierarchical and nonhierarchical analysis provided solutions characterised by high correspondence and stability. This acts as a confirmation for the results of the analysis. Two further avenues for validating the solution were pursued. The first involved a split-sample validation following the recommendations by Hair et al. [1998]. The original data set was split into two samples. Using the data in the first sample, a hierarchical cluster analysis was performed. The cluster centres from this solution were subsequently used as initial seed points for a nonhierarchical analysis of the second sample. Results from the analysis of the two samples were then compared with each other as well as with the original solution.

Results from the split-sample validation procedure are illustrated in Exhibit 11.6. It can be seen that there is a high correspondence between the two cluster solutions and also in relation to the original solution.

The last step of validating the cluster solution involves an assessment of its predictive validity. SMM growth is the central performance criterion of the study. Table 11.4 illustrates the comparison of the 5 types of SMMs based on their growth performance.

Cluster	SALES	GROWTH
1	15.94	13.25
2	21.39	18.85
3	14.33	16.00
4	8.37	5.64
5	34.98	23.02
F value	3.3164	1.2209
Significance	0.0119	0.3033

Table 11.4 Assessment of the predictive validity of the cluster solution

Exhibit 11.6

Split-sample validation of the cluster solution

11.6a Clustering variable profiles from hierarchical analysis for sample 1												
Cluster	CONTRCT1	CUST_NO	DEPNDNCE	FACTOR1	MKTG2	MKTG3	PR_TYPE1	PR_TYPE2	PR_TYPE3	SUB	Cluster size	
1	6.30	4.60	23.91	2.75	3.04	3.56	18.65	73.26	8.08	0.60	23	
2	9.46	4.40	35.75	2.74	2.09	1.90	97.18	1.78	1.03	0.59	33	
3	28.03	4.46	24.33	3.77	3.15	4.68	60.65	24.65	14.68	1.18	32	
4	3.88	4.55	19.67	2.30	3.88	3.44	3.88	4.44	91.66	0.11	9	
5	87.20	2.40	62.00	3.60	1.60	2.00	80.00	20.00	0.00	1.00	5	

11.6 b Clustering variable profiles from nonhierarchical analysis for sample 2 using centres from sample 1 as initial seed points												
Cluster	CONTRCT1	CUST_NO	DEPNDNCE	FACTOR1	MKTG2	MKTG3	PR_TYPE1	PR_TYPE2	PR_TYPE3	SUB	Cluster size	
1	8.70	4.61	20.50	2.83	3.50	2.94	9.13	13.13	7.22	0.55	18	
2	5.03	3.69	41.32	3.35	1.46	2.03	91.73	12.66	1.11	0.38	26	
3	17.35	4.46	28.37	3.54	3.35	4.00	78.85	17.87	5.60	1.00	28	
4	5.20	4.80	19.50	2.62	2.40	3.50	8.90	9.18	84.10	0.60	10	
5	59.22	3.00	55.55	3.68	2.00	2.66	89.16	12.94	5.83	1.70	18	

The higher growth that Managers exhibits relative to the other types of SMMs is in agreement with the theoretical background to this study as discussed in Chapters 2 and 3. The comparatively higher performance of Managers and Captives is also in line with findings from the semi-structured interviews with SMMs and with the results of the multiple regression analysis, which identified long-term contracts as a significant determinant of SMM growth. Managers and Captives are the two types of SMMs that have a comparatively considerable proportion of their sales covered by long-term contracts.

11.6 Summary

Cluster analysis was performed to develop a relationship-oriented classification of SMMs. Building on the theoretical foundations of this study and the findings from the previous stages of analysis, cluster analysis led to the identification of five distinctive types of SMMs. The interpretation of the results provided detailed insight into naturally occurring behavioural patterns that SMMs exhibit with regard to managing their relationships with customers. The next and final chapter of this thesis performs a synthesis of the study findings, discusses the implications for business practice and suggests potential avenues for exploitation by future research.

CHAPTER 12

DISCUSSION AND CONCLUSIONS

12.1 Introduction

The previous chapters have discussed the background and methodology for this study, the data collection, the analyses undertaken and the results obtained. This final chapter attempts to place these results into perspective: it discusses them in order to develop some conclusions and specifies what the contribution has been in terms of theory development and industrial practice. It uses the findings of the study as a basis to highlight some potentially interesting areas for future research.

12.2 Brief overview of the study

The objective of this study has been to investigate the role of Small- to Medium- sized Manufacturers (SMMs) in supply chains and to link this role with SMMs' growth potential. The study reviewed a number of research streams including Supply Chain Management, Industrial Marketing, and the literature on factors that affect firm growth. The review showed that research dealing exclusively and systematically with the SMM sector is very limited. Furthermore, empirical findings regarding the role of SMMs in supply chains have been far from conclusive. In the context of the new paradigm of competition that Supply Chain Management has introduced in recent years, this limited knowledge creates an important gap in theory and industrial practice.

The study therefore set to explore in greater depth whether and to what extent SMMs can be active members of the supply chains in which they operate, and in particular how SMMs can manage their relationships with customers in order to increase their growth potential.

The aim of this study was operationalised in the form of two major objectives, namely to:

- identify the relationship management activities employed by SMMs and
- investigate the links between relationship management activities, critical dimensions of customer relationships and growth potential

To this end, a series of semi-structured interviews with a set of SMMs and a large-scale mail survey of SMMs were conducted. Data collected through the mail survey were analysed using a variety of statistical techniques including factor analysis, multiple regression analysis and cluster analysis. The following sections discuss the results of the analyses performed. These results are viewed in the context of previous work in the role of SMMs in supply chains. Findings from the semi-structured interviews with SMMs are also used to provide greater insight into how the research findings correspond to business practice.

12.3 Problems that SMMs encounter in managing customer relationships

The interviews with SMMs verified findings from previous studies in terms of what problems SMMs perceive in working with their customers [see for example, Waters-Fuller 1996, Leverick and Cooper 1998, Lamming 1995, De Toni and Nassimbeni 1996, New and Burnes 1995]. According to the SMMs interviewed, obstacles in working effectively with customers include:

- Limited influence over important aspects of the relationship, such as ordering patterns and delivery arrangements
- Access to low level personnel in the customer organisation
- Frequent changes in buying personnel which hinder the development of personal relationships
- Conflicting requirements expressed by different customer departments
- Coordination problems leading to a disproportionate amount of time spent on firefighting tasks and resolving disagreements.

- Exploitation by customers who take advantage of the SMM's expertise in design and development and then take their business elsewhere.
- High customer schedule instability
- Customer demands for extreme price reductions
- Lack of customer commitment to the relationship, especially in the form of long-term agreements
- Limited weight of the SMM in the market, especially when competing against larger firms

It became evident from the above that SMMs largely focus their criticism on customers' behaviour on communication and coordination issues, commitment to the relationship, and fairness. These are considered decisive in the development, or hindrance, of effective relationships.

12.4 Relationship management activities of SMMs

Exploratory factor analysis was used to investigate how SMMs manage their relationships with customers. The analysis identified five distinct groups of activities--responding to customers' uncertainty about their own needs, adopting a total acquisition cost approach, getting feedback from customers, devolution of supply chain responsibility to the shop floor, and use of computer links with customers. These groups of activities, supplemented by the SMM's orientation towards increasing its own share of value-added in the supply chain, comprise the relationship management activities examined in this study. These activities are discussed below. Examples from the semi-structured interviews are used to put these in context.

Responding to customers' uncertainty about their own needs.

These are activities aimed at providing customers with integrated solutions rather than simply a product. Activities include:

- providing assistance to customers in applications development
- undertaking formal product design and development
- influencing product design if not formally undertaken

- getting feedback from customers on product design, performance and desired features.

SMMs who are solution providers define their businesses in terms of the functions that they perform for their customers rather than in terms of the physical product they make. In this context they offer a wide range of services to their customers. Some of the services that the SMMs interviewed offered to customers included assistance in applications development, design for manufacture, consultancy in setting up special facilities, and training of customer personnel in techniques and work methods that the SMM has mastered itself.

Even in cases where no formal design is undertaken, SMMs provide ideas for improvements. In other cases, they possess special knowledge and skills the customer heavily relies upon.

SMMs who are solutions providers stay with the customer before, during and after the sale. Two of the SMMs interviewed (Companies D and H) employ engineers to help customers determine and meet their needs, and make follow-up visits to get feedback from customers on design, performance and desired features. Customers become a major source of idea generation for new product development. Solutions provided to customers and feedback from them are assessed to identify market opportunities for new products (Companies D and H).

Increasing own share of value added in the supply chain

SMMs can develop their product/service offering with a view to increasing their own share of value added in the supply chain(s) in which they operate. This can be done by, for example:

- developing subassemblies
- combining products and/or processes to perform functions previously performed by the customer or other suppliers

A strategy of increasing own share of value added in the supply chain implies that the SMM defines its business in terms of the functions it performs for the customer. SMMs that pursue such a strategy (see Companies D and J) constantly seek ways to assume more customer functions.

Apart from skills and capacity, such a strategy requires top management commitment. One of the SMMs interviewed (Company I) pursued this strategy in a piecemeal fashion, for individual customers, and then simply gave up. In other cases, as shown by the case of Company H, the very nature of the company's products/services suggests that individual product lines/services may be readily combined to assume more customer functions. Management, however, may be unaware of the potential for using this complementarity as a marketing tool.

Adoption of a total acquisition cost approach

These activities aim to demonstrate how use of the SMM's product can reduce customers' total costs, thus satisfying a critical buying criterion. Activities include:

- quantifying the impact from the use of the SMM's product on customer's performance
- suggesting how cost savings can be made over the years
- providing information about future technological developments for this product
- providing education/training in product use

Even large customer firms may not have formalised procedures for asking suppliers to provide information on total costs incurred by product use in their proposals, as an interview with a large autoassembler revealed. Adopting a total acquisition cost approach may make a difference when an SMM competes with other suppliers for the customer's business. It suggests the existence of a long-term orientation in the relationship and, through customer education, helps build better personal relationships with potentially influential members of the customer organisation.

Devolution of responsibility for supply chain management to the shop floor

These activities aim at company-wide involvement in customer relationship management, and include:

- ensuring that shop floor employees are knowledgeable of customers' processes and how customers use the SMM's products
- empowering shop floor employees to manage customer order placing and execution
- empowering shop floor employees to discuss product/process features with customers.

The contact patterns between the interviewed SMMs and their customers verify earlier findings by Cunningham and Homse [1986] according to which, rarely do supplier-customer relationships take the form of simple dyadic relationships between salesman and buyer. Several people from different functional departments in supplier companies may be involved in a network of contacts with their counterparts in the customer firm, and this embraces multiple levels in the organisational hierarchy. This creates enormous opportunities for understanding and influencing customer needs, something that Company J systematically pursues through the training that it provides to customer personnel. Company H shows that service engineers can be a valuable source of knowledge about customers and competitors and can exert influence on customer buying decisions.

Visits to customers to see customer processes and how products are used are valuable tools for developing a customer-oriented culture within the firm, and identify areas for improvements. This is in sharp contrast with a philosophy of pushing the order out of the shop that some SMMs report (see Company A).

Empowerment of employees goes hand in hand with investment in employee training. SMMs who devolve increased responsibility to the shop floor have comprehensive training and development programmes for their employees, tailored to the individual's needs (see companies I and J). Others, in comparatively less sophisticated

environments in terms of skills required, rely heavily on a loyal and experienced workforce which is with the company for many years (see, for example, Company H).

Getting feedback from customers

Areas include the SMM's quality and delivery performance as well as costs incurred by the customer.

Dissatisfied customers will not always express their dissatisfaction with the level of service they get from their suppliers: more often they just walk away [Reichheld 1993]. Customer feedback on performance is therefore an important coordinating mechanism. It can be the basis for establishing commonly agreed performance standards, resolving disagreements, identifying problem areas and setting goals for improvement.

Even where no formal procedures for feedback exist, some SMMs take the initiative and regularly ask for feedback from their customers (see, for example, Company C).

Computer links with customers

Establishment of computer links with customers aims at facilitating the flow of material, information, and expertise. Common applications include order processing, product design and production scheduling.

Mutual satisfaction and trust facilitate the use of information technology across firms. Some SMMs build on a positive relationship record and use computer links for attacking waste, cutting lead times and improving response to customer needs (see companies D and J).

In addition to the observations discussed so far, a number of important points arose from the results of factor analysis. Knowledge of customer processes and product use has been proposed as a critical element of a customer-oriented firm and a distinct characteristic of cooperative customer relationships. Results from the factor analysis indicate that there is a clear distinction between managers and shop floor employees with regard to this particular form of knowledge. This is evident from the fact that

these two do not load highly on the same factor, suggesting that employees' customer knowledge and involvement is not an inherent characteristic of an SMM context. The fact that a company is small does not necessarily mean that customer contact is simpler, more direct, and penetrates the SMM organisation in greater depth. There has to be a clear strategy of devolving responsibility to the shop floor for customer orientation to become part of the company culture, not least because this requires commitment to employee training. This is in agreement with observations made during the semi-structured interviews with SMMs. Company I had to undergo dramatic changes in its workforce policies in terms of training, appraisal, and empowerment in order to develop a customer-oriented culture across the organisation and to involve shop floor employees in customer order management.

A second observation refers to the relationship between the nature of products and the relationship management activities that SMMs employ. Factor analysis showed that the nature of the SMM's products, (whether predominantly tailor-made to a customer's specific request, made-to-order from a standard catalogue or product listing, or made-to-stock without a specific customer order) is quite distinct from relationship management activities. In other words, product customisation is only one of the strategies with which an SMM may choose to compete and, by no means, does this alone imply a customer-oriented culture within the company.

Factor analysis also showed that there are different forms of customer feedback. This is in agreement with Stuart et al. [1995] who distinguish between feedback systems focusing on assessments of delivery and service and more comprehensive ones, which include assessments of product serviceability and features. The factor analysis performed here indicated that the latter form of feedback is inextricably linked with a strategy of the SMM's being a solution provider to customers.

The relationship management activities that were discussed in this section, provide a framework for describing the service aspect of the SMM's operations. This framework extends beyond the conventional notions of customer service to include

activities aimed at improving supply chain operations through the exchange of information and expertise.

12.5 Links between relationship management and marketing activities of SMMs, nature of customer relationships and SMM growth

Other researchers have pointed out the difficulty of studying and assessing the quality of interorganisational relationships due to their multidimensional nature, the difficulty of collecting objective data, and the subjectivity of the parties involved in these relationships [Heide 1994, Kearney A.T. 1994, New and Burnes 1995, New 1996].

In order to overcome these difficulties, this study relied heavily on a cross-evaluation of relevant literature and semi-structured interviews with a set of SMMs to identify critical dimensions of customer relationships and employ, to the extent possible, objective measures for their operationalisation. In this context, the study identified the following critical dimensions of customer relationships: *size of customer base*, *dependence*, *relationship strength* and *relationship fairness*. *Relationship strength* refers to the extent to which there is a demonstrated long-term commitment to the relationship from supplier and customer. *Relationship fairness* refers to the extent to which transactions between supplier and customer take place within an environment of negotiation and sharing of benefits and burdens from the relationship. The following sections discuss the findings with regard to the factors that influence these dimensions.

12.5.1 Determinants of *relationship strength* and *fairness*

Application of multiple regression analysis provided useful insights into the combination of factors which influence the nature of customer relationships. Results of the analysis provide good support for the central thesis of this study which recognises that SMMs can be active members of the supply chains in which they

operate, in terms of understanding, responding to, and influencing customer needs as shown in the conceptual model in Figure 4.1.

The study results indicate that SMMs can influence *relationship strength* through specific relationship management activities. In particular, being a solutions provider can lead to stronger relationships with customers. This is indicated both by the extent of long-term agreements and the degree of cooperation that SMMs who are solutions providers achieve in their customer relationships. Responding to customers' uncertainty about their own needs can increase the interdependencies between the two parties, thus potentially leading to the adoption of a longer-term view and the commitment of greater resources to the relationship from the customer's point of view.

Developing the product/service offering with a view to increasing own share of value added in the supply chain can have a similar effect on *relationship strength*, at least in the form of long-term agreements. SMMs who possess a larger share of value added are more likely to be considered as long-term partners by their customers.

Adopting a total acquisition cost approach when trying to get the business of a customer was not found to have a significant effect on customer commitment. However, SMMs who are solutions providers tend to adopt such an approach to a greater extent. It was also found that exporters, who have to deal with greater customer uncertainty about foreign sources of supply, are more likely to adopt such an approach. This indicates that adopting a total acquisition cost approach may be particularly useful for SMMs in overcoming potential customer uncertainty or even resistance from customers when facing much larger competitors. In the sample of SMMs interviewed in this study, Company H was a clear example of an SMM who have adopted this approach as they are competing with much larger companies for customer business worldwide.

Getting feedback from customers on quality, delivery and cost performance is another activity which is strongly associated with being a solutions provider. Furthermore, the

partial correlation analysis indicated that customer feedback *per se* is significantly associated with long-term agreements. In other words, it appears that customer feedback is a coordinating mechanism used in increased conditions of interdependence between firms. The semi-structured interviews suggested that many SMMs actively seek customer feedback, the mechanisms used however, do not always exhibit a formal and routine structure.

Devolution of responsibility for customer management to the shop floor was found to be associated with longer-term agreements with customers. It appears that the activities proposed by the concept of the *service factory* [Chase and Garvin 1989] and more recently of the *service-profit chain* [Heskett et al. 1994], are applicable in an SMM context and are valued by customers. Interestingly, however, it was found that devolution of responsibility to the shop floor was negatively associated with firm size. In other words, larger firms within the SMM sector tend to devolve less responsibility for customer management to the shop floor. This indicates that, as companies grow larger, there is the need for explicit strategies that aim to ensure that the alleged advantages of small firms – namely, company-wide customer focus and customer visibility as well as personal attention to customer needs -- remain in place.

The absolute size of the SMM was found to be positively associated with the extent of long-term agreements with customers. Stronger relationships represent commitment of resources and risks for customers and suppliers alike. Given the high death rates in the SME sector, the absolute size of the SMM may actually act as a form of assurance to the customer regarding the viability of the supplier and hence continuity of supply.

The size of customer requirements is also an element of the transactional environment which positively influences the extent of long-term agreements with customers. As discussed in Section 6.9, the customer's production technology has been suggested to have an impact on the nature of its relationship with suppliers. The results of this study suggest that larger customer order sizes favour long-term agreements. It appears that the irregularity of supply found in unit and small batch production environments acts as a hindrance to the development of long-term agreements with customers.

Findings from the interviews provide support for this argument. The nature of Company A's business is project-based: as a result, they work on an individual order basis despite the fact that they get repeat business from customers. In the case of Company H, the selling cycle may extend to five years, thus precluding formalised long-term agreements.

The study results also provide insight into the links between relationship management activities and *relationship fairness*. SMMs who are solution providers determine delivery policies more often through negotiation with customers. It appears that increased interdependence leads both suppliers and customers to consider each other's needs and constraints to a greater extent. Contrary to what was hypothesised, however, increasing the SMM's share of value added in the supply chain was associated with higher customer schedule instability. The initial hypothesis was that customers tend to adopt a more relational behaviour towards those suppliers that become more important players in the supply chain, and that their products/services constitute important purchases. Results of the analysis indicated that, as SMMs undertake more responsibilities and become more important players in the supply chain, they face greater pressures to absorb and respond to demand uncertainty. This is in line with observations from the semi-structured interviews with SMMs. Companies D and J were focusing more than the others on developing their product/service offering with a view to increasing their own share of value added in the supply chain. Both companies were facing high customer schedule instability and very short response times required by their customers. Interestingly, however, they were considering fast response to changes in schedules as part of the service they offered to their customers.

Greater customer order sizes are also associated with higher customer schedule instability. This may be a manifestation of the power/dependence imbalance characterising relationships in large batch production systems which may hinder the development of closer relationships, as Johanson [1982] suggests. It may, however, be a manifestation of the bullwhip effect -- larger order sizes may mean that there is a

poor correspondence between ordering practices and actual needs which leads to schedule stability.

This study did not manage to identify any significant influence on the delivery-to-payment cycle. The mean value of 56 means that on average, SMMs in the sample remain unpaid by their customers 56 days after delivering the product to them. This is higher than the average of 46 days for the UK industry [Terazono 1999], indicating that the SMM sector experiences an unfair treatment in terms of late payments from customers, which may create cash flow problems and may constitute an obstacle to growth.

Overall, it is important to note that the relative contribution of the relationship management activities to *relationship strength* is much higher than the contribution to *relationship fairness*. In other words, it appears that SMMs can exert a much greater influence on customer behaviour in terms of commitment than in terms of fairness. The long-term view in the relationship combined with increased pressure on the trading partner that was proposed for the automotive industry [Lamming 1993], appears to characterise many industrial relationships beyond that.

Interestingly, characteristics of the transactional environment do not appear to influence *relationship strength*. The existence of larger competitors does not influence the extent of long-term agreements that SMMs have with their customers. It may be the case that customers see advantages in dealing with smaller suppliers due to power considerations and/or flexibility considerations. The number of competitors also does not appear to have an influence on *relationship strength*. Factors which were not included in this study may be the cause of it, such as the customer's knowledge of the supply market and the customer's risk aversion. In any case, however, it appears that market characteristics in terms of the number and relative size of competitors do not act as a hindrance for SMMs to develop strong customer relationships. A weak effect is observed however, with regard to *relationship fairness*. In particular, the number of competitors appears to adversely affect customer schedule stability.

Study findings support the thesis that provision of services leads to stronger supplier-customer relationships. Provision of expertise, the adoption of a relational behaviour and an enhanced role in the supply chain on the part of the SMM are characteristics that are potentially valued by customers and can lead to greater customer commitment. Stronger relationships, however, do not necessarily mean fairer relationships. On the contrary, it appears that customers, when they make commitments to SMMs, expect them to absorb customer uncertainty. This in fact may be, as some SMMs view it, an essential part of the service they offer to their customers.

12.5.2 Determinants of customer base size and dependence

The study results suggest that SMMs who are solution providers and who develop their product/service offering with a view to increasing their own share of value added in the supply chain tend to work with fewer customers. Knowledge-based relationships require a significant commitment of resources which leads those SMMs to focus on serving the needs of fewer customers. Working on the basis of long-term contracts *per se* is associated with smaller customer bases. These findings are in support of studies arguing about the incompatibility of large customer bases and closer relationships that are observed in industrial practice [for example New and Burnes 1995, Sako et al. 1994]. However, a side effect of having a smaller customer base appears to be the greater dependence on few customers.

In terms of marketing activities, participation in trade shows, advertisements in trade journals, and personal sales calls are associated with larger customer bases. Participation in trade shows and advertisements in trade journals offer a great opportunity to address large numbers of potential customers, and to come into contact with many of them. Personal sales calls, on the other hand, give the opportunity for personal contact with the customer in order to understand his needs and obtain performance feedback on follow up sales calls. These findings are in agreement with observations made during the semi-structured interviews with SMMs. Companies B, D, and I use a combination of these marketing tools to increase their customer base coverage in terms both of breadth and depth.

In contrast, direct mail, phone calls, top management involvement and word of mouth do not have any effect on the size of the customer base.

Study findings support the view that focusing on fewer customers is a prerequisite for stronger relationships. On the other hand, effective marketing calls for the use of tools that allow addressing large customer bases and, at the same time, paying personal attention to customer needs.

12.6 Determinants of inventory performance and growth

The study results suggest that SMMs who have a higher percentage of long-term contracts have a lower ratio of production to delivery batch size, thus indicating that they maintain less inventory. Not surprisingly, the nature of products has an effect on inventory levels: SMMs who tailor their products to a customer's specific request also have a lower ratio of production to delivery batch size.

The study results also suggest that contracts are associated with higher levels of sales and employment growth. Several studies have suggested that the lack of formalised agreements causes problems for suppliers in long-term planning [Pettitt 1992] as well as lack of willingness, on their behalf, for investments and innovation [De Toni and Nassimbeni 1996, Lyons and Bailey 1993]. Long-term contracts reduce demand uncertainty for the SMM and the need for forecasting. This helps explain the positive effect of long-term contracts on both inventory performance and growth.

Responding to a structured set of customer requirements has a positive effect on growth as suggested by the positive association between organisation of production into cells for products or customers and sales growth. This finding supports the notion that an important part of the company's strategy is the ability to say "no" [Sprague et al. 1998]. This is particularly relevant for SMMs who may be extremely reluctant to pass up any business.

On the other hand, frequency of major changes in the product range has a negative effect on sales and employment growth. Observations from the semi-structured interviews suggest that lack of training may be a reason behind this finding. SMMs may find it particularly difficult to cope with the skills requirements that frequent product changes pose. This is supported by other empirical studies [for example, Cagliano et al. 1999] which show that training and education is a particularly weak area for small companies.

Contrary to earlier findings [Birley and Westhead 1990], the size of the customer base does not have a significant effect on growth. The same holds for dependence. These findings appear to reinforce the proposition suggested by Storey [1994] that dependence -- and this study adds the size of customer base -- *per se* are not necessarily “good” or “bad”. It is rather the context in which these dimensions develop -- that is, the characteristics of the portfolio of relationships matter. This is discussed in the following section where the relationship-oriented typology of SMMs, as derived from cluster analysis, is evaluated.

Customer commitment in the form of long-term agreements reduces uncertainty for the SMM, both in terms of demand and investment return. This appears to form a basis for SMMs to grow.

12.7 Relationship-oriented typology of SMMs

The cluster analysis of SMM activities and critical dimensions of customer relationships produced five naturally occurring types of SMMs – namely, the MTO Standardisers, the MTS Standardisers, the Satellites, the Captives, and the Managers. MTS and MTO Standardisers differ in the primary nature of their products – that is, they are predominantly Make-to-Stock and Make-to-Order manufacturers respectively. They exhibit similar patterns with regard to the way they define their businesses, their marketing activities and the structure of their customer base. They can therefore be regarded as members of essentially the same type – that is, the Standardisers.

An analysis of the SMM types shows that these differ substantially in the ways they define their businesses and in their choices with regard to the structure of their customer bases, as measured by the size of their customer base and by their level of dependence. The SMM types can be conveniently arranged along two dimensions; *operations focus* vs. *marketing focus*. As suggested in Chapter 2, customer functions constitute an essential parameter in defining a business. *Operations focus* is an indicator of how the SMM defines its business through the functions it performs for its customers. *Marketing focus* on the other hand, is an indicator of how the SMM structures its customer base. Figure 12.1 illustrates the arrangement of the SMM types along the dimensions of operations and marketing focus and highlights the strategic choices that determine the profile of each type.

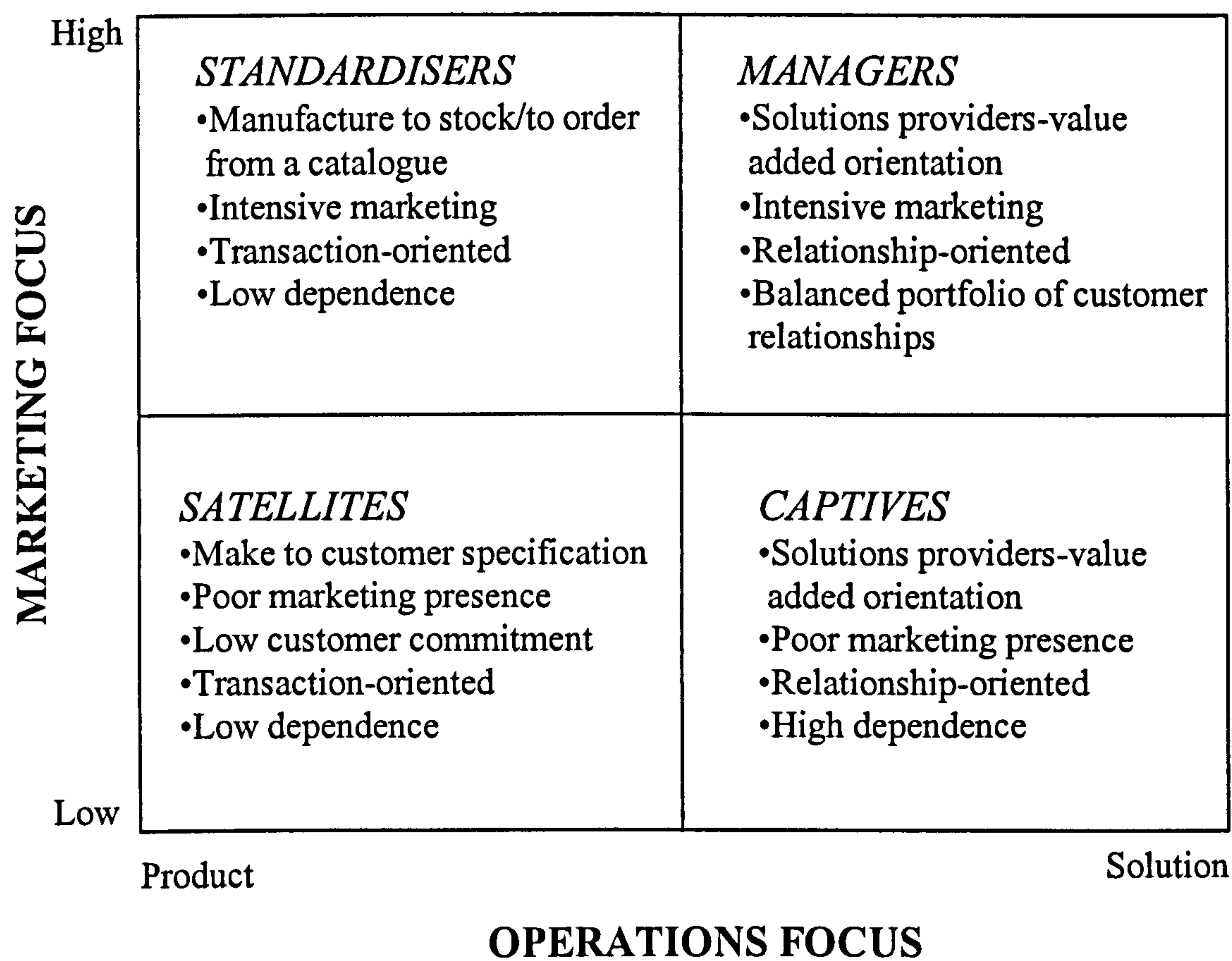


Figure 12.1 Relationship-oriented typology of SMMs: Strategic choices and profiles of SMMs

The typology that is illustrated in Figure 12.1 places the findings of this study into context. It provides evidence that SMMs can actively manage their customer relationships by making strategic choices with regard to how they define their business and how they structure their customer base. In particular, Managers show what effective customer management may mean. They show that it is possible for SMMs to develop a balanced portfolio of customer relationships which combines strong relationships with the avoidance of excessive interdependence on any single customer. For this to happen, however, SMMs should define their business as solutions providers and at the same time exhibit a strong marketing presence by contacting customers both in terms of breadth and depth.

The findings of this study with regard to different SMM types converge to a large extent with findings from the study by Bensaou and Venkatraman [1996] (for a more recent publication see Bensaou [1999]) into types of relationships in the US and Japanese automotive industries. The relationship types proposed by Bensaou [1999] bear strong similarities with the typology suggested by this study. For example, Bensaou [1999] identified the exchange of products/services that involves strong engineering expertise and effort favouring “Strategic Partnerships” or “Captive Supplier” relationships. “Market Exchange” relationships on the other hand, involve the exchange of highly standardised products, requiring little engineering effort and expertise. “Strategic Partnerships” are characterised by customer commitment to the relationship, and large amount of time spent on coordinating issues. In “Captive Supplier” relationships, suppliers are heavily dependent on the customer, a lot of time is spent on coordinating issues; the supplier however appears to have limited influence and access to the customer organisation. “Market Exchange” relationships are in essence transaction-oriented.

Many of the characteristics of the typology proposed by Bensaou [1999] bear resemblance with the nature of the types of SMMs suggested by this study. It should be noted that, in comparison with this study, the Bensaou study uses a different research design -- a single industry (automotive), a one-to-one unit of analysis, focus on automanufacturers and their direct suppliers and adoption of the customer

perspective. In terms of theory development, it is important that this study and the Bensaou study adopt different perspectives, yet reach conceptually comparable conclusions.

Wood et al. [1996] classified SMMs based on the technological content of their products and the level of collaboration with their customers. Their sample was chosen so as to include “best practice” SMMs who outperform competition in terms of productivity, wages and exports. Wood et al. [1996] identify four generic supplier strategies – “commodity suppliers”, “technology specialists”, “collaborative specialists”, and “problem-solvers”. These supplier strategies partially converge with the SMM types identified by the present study. Unlike this study, Wood et al. [1996] do not shed any light into how different SMM types combine structural characteristics of customer relationships with choices about defining their business. However, the fact that Wood et al. [1996] reach conceptually comparable conclusions increases confidence in the validity of the typology proposed by the present study.

The comparison of the types of SMMs with regard to their growth potential showed that there is a differential, in particular along the operations focus axis. Both Managers and Captives achieve higher growth than Standardisers and Satellites. Figure 12.2 shows the 95% confidence intervals for sales growth across the types of SMMs.

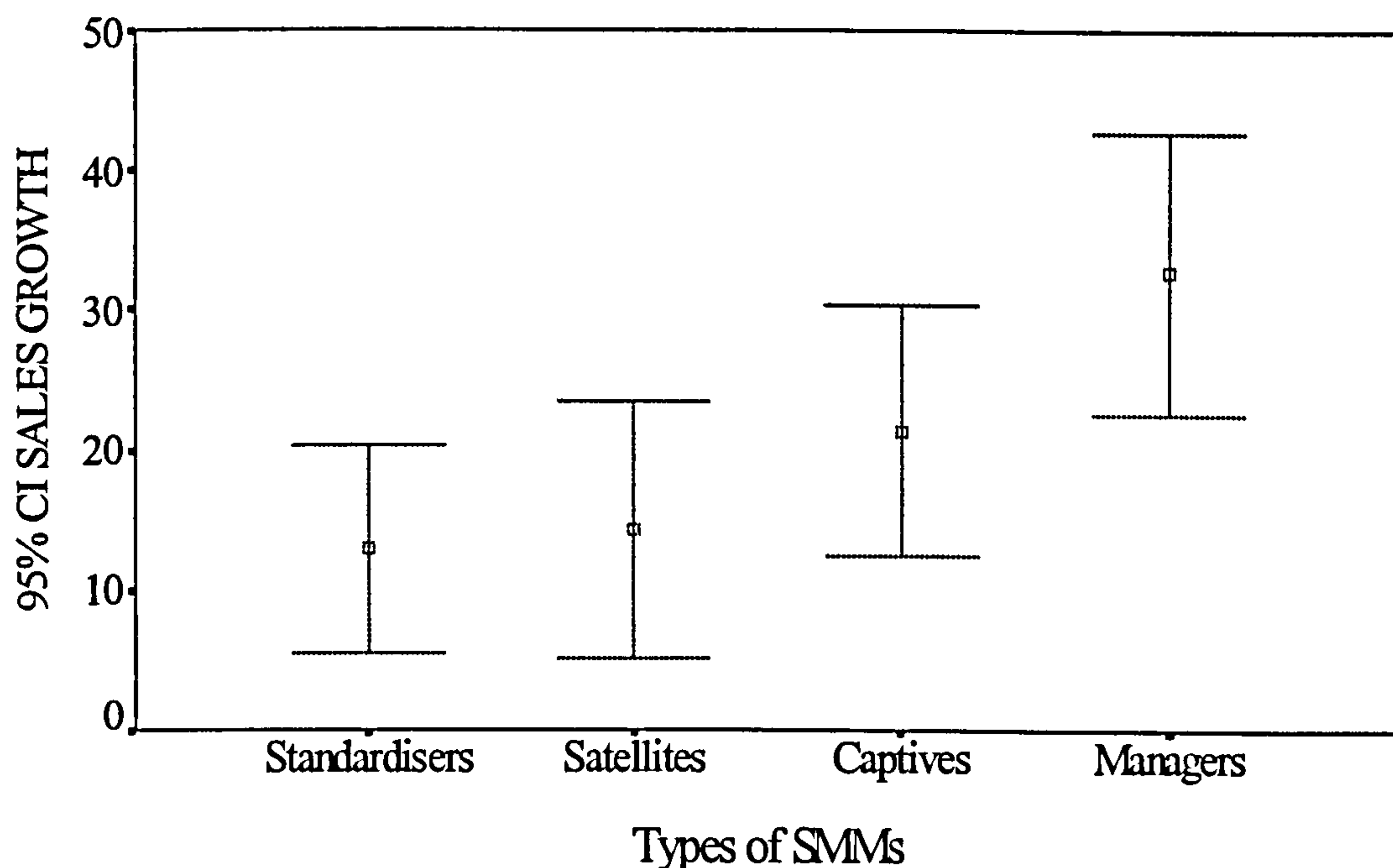


Figure 12.2 Growth potential of SMM types

As shown in Figure 12.2, Managers clearly exhibit higher growth potential than the other SMM types. These results show that the development of a balanced portfolio of customer relationships, as initially hypothesised by this study, pays off for SMMs who desire growth.

Strategic choices with regard to operations focus and marketing focus have a clear effect on the SMM's growth potential. This helps explain why examination of dimensions such as size of customer base and dependence – in an isolated way – fail to provide decisive links between these dimensions and growth potential.

12.8 Contributions to theory

It should be emphasised that growth, and in particular fast growth are not always on the strategic agenda of SMMs. This is supported by previous studies [Turok 1991], and by discussions with experts and owners and/or managers of SMMs. On the other hand, there is a widespread recognition in Europe and the US that growth SMMs, and

SMEs in general, are the major source of employment generation [for example, Birch 1991, Flynn 1998, Storey 1994]. This renders the study of factors that affect SMM growth particularly important for theory development and policy making.

The literature review discussed in Chapters 2 and 3 documented the following:

- Research that focuses exclusively on the SMM sector is scarce
- Research on the factors affecting SMM growth has largely neglected the management of operations in SMMs, especially in relation to their role in supply chains.
- Studies in Supply Chain Management have usually adopted the large firm's perspective and focused on a single industry, thus hindering the development of generally applicable theories.

This study has focused exclusively on the SMM sector. It adopted an SMM perspective to investigate the role of SMMs in supply chains and their growth potential. It also addressed a wide range of sectors within the engineering manufacturing industry. In this way, it has attempted to fill gaps in existing research that the literature review identified.

The study focused on the service aspect of the SMM's operations. It drew upon Industrial Marketing and Supply Chain Management literature to model this aspect. It conceptualised and measured management processes associated with understanding, responding to, and influencing customer needs, in an SMM context. According to some researchers [Economist March 1999], theories of growth to date have failed to provide definite answers into why firms grow. This study does not, of course, argue that it can provide the answer to this question. It has, however, identified specific management processes with regard to the management of customer relationships that contribute to growth.

As generally happens with theory development, the contribution of this study was based on previous theoretical advancements.

The study provided empirical support for the proposition that SMMs can be active members of the supply chains in which they operate. This gives support to a central thesis in the Industrial Marketing literature [see IMP Group 1982] which emphasises that both the buyer and the seller are active in an industrial relationship. More specifically, the results suggest that strategic choices made by SMMs with regard to managing their customer relationships will have an effect on the nature of these relationships. Coping with the multidimensionality and complexity of these relationships, this study identified a number of critical dimensions including relationship strength, relationship fairness, size of customer base and dependence. The results provide insight into how and to what extent SMM activities influence the nature of customer relationships. It was shown that *relationship strength*, size of customer base and dependence are much more susceptible to influence by SMMs than *relationship fairness*.

The literature review in Chapters 2 and 3 pointed out that, despite widespread recognition of individual customers in industrial markets, there is much less agreement on fundamental customer attributes such as customer loyalty, characteristics of key customers, dependence, and how these may relate to firm success. This study managed to shed more light onto the inconclusive links between the nature of relationships and SMM performance. It was found that customer loyalty is likely to increase the SMM's growth potential. SMMs who define their business as being solutions providers -- thus offering supplementary services to their customers beyond the actual physical product -- exhibit higher growth than those SMMs who focus on the product alone. For the most successful companies in the set of SMMs interviewed, key customers were those that were making full use of the SMM's services. These were the customers that were valued most highly by the SMM.

These findings invalidate the argument by Kaplan [1994] who -- adopting an Accounting perspective -- suggested that it is more desirable to serve customers who want standard products, have predictable requirements, and do not require support services.

Finally, the proposed relationship-oriented typology of SMMs provides empirical support for the proposition made by Krapfel et al. [1991] according to which firms might find it desirable to develop a balanced portfolio of customer relationships characterised by the development of good working relationships and avoidance of excessive dependence. The study showed that this is possible for SMMs and that it pays off in terms of growth potential.

12.9 Contributions to practice

The discussion so far has pointed to a number of implications that the study findings bear for business practice. These implications are summarised below in the form of guidelines for managers in SMMs:

1. Focusing on providing solutions to customers rather than just products is a strategy which can lead to stronger customer relationships. Being a solutions provider implies a systematic effort to understand customer needs.
2. Developing the product/service offering so as to increase own share of value added in the supply chain can also lead to stronger customer commitment.
3. Customers develop stronger relationships with SMMs who are service-oriented. Devolution of responsibility to shop floor employees for managing aspects of customer needs and acquisition of customer feedback are mechanisms for information exchange and provision of service that are valued by customers.
4. Some of the most successful SMMs consider their key customers to be those that make full use of the services that SMMs offer beyond the actual product, and not those that have standard, predictable requirements.
5. Marketing tools that allow contact with customers in both breadth and depth -- including participation in trade shows, advertisements in trade journals, and personal sales calls -- are effective means of getting new customers.

6. The customer demand that the production system has to cope with directly affects growth potential. A strategy of responding to a structured set of customer requirements supports growth better than a strategy of taking up any business.
7. Building stronger customer relationships requires focusing on serving the needs of fewer customers. However, effort should be made to distribute business more evenly among customers, thereby developing a more balanced portfolio of customer relationships. This can be done by combining a strategy of being a solutions provider for customers with a strong marketing presence that allows reaching more customers.

The overwhelming message of this study is that strategic decisions on the development and management of supply chain relationships are critical to the ability of SMMs to grow. Advances and accessibility in manufacturing and engineering technologies make distinctions between competing companies increasingly blurred. In this respect, service is increasingly becoming the new challenge for manufacturers. Defining service in a manufacturing context, developing and delivering service packages to different customers and customer groups, are big challenges for all manufacturing companies. This study showed that the most successful (in terms of growth) SMMs particularly nurture the service aspect of their operations. They perceive supply chain relationships as vehicles for understanding customer needs and delivering service to customers by utilising their most important asset, that is, their employees. This strategy is pursued within a resource allocation framework defined by the decision to develop a balanced portfolio of customer relationships that allows less dependence, transfer of knowledge among different customer relationships and spread of risk. This study suggests that growth does not simply happen by accident; the way companies manage their relationships with other organisations in the supply chain affects their growth potential.

12.10 Suggestions for future research

A primary requirement for any empirical study is replication using different samples and research settings. This will hopefully provide further evidence for the validity and generalisability of the research results.

The study uncovered naturally occurring types of SMMs with regard to the strategic choices they make for developing and managing customer relationships. The analysis showed that these types exhibit different growth potential, clearly indicating that a move towards the Manager type is of benefit to those SMMs who wish to grow. The present study did not address the dynamic nature of the typology it proposed. In other words it did not address the transformation of the SMM from a Captive, Satellite or Standardiser to a Manager. Such a transformation will certainly require fundamental changes in management processes and skills available to the SMM. It may also be affected by wider issues of competition. Longitudinal research is needed to investigate how such transformation is possible and, more importantly, successful.

More research should be undertaken into the potential effects of the transactions environment on the nature of customer relationships. This study found only weak evidence of such effects. Previous work suggests, however, that the environment in which relationships develop -- including market and company characteristics -- plays an important role.

The study adopted the SMM's perspective in investigating the research questions. As a result, a parameter that was not accounted for by this study referred to *customer sophistication*. By *customer sophistication* this study means the degree of the customer's awareness of, and competence in formulating and implementing purchasing strategies and adopting, where appropriate, a relational behaviour towards its suppliers. Observations from the semi-structured interviews with SMMs suggest that customer sophistication is highly variable across and within industries. Given the active role of both suppliers and customers in industrial relationships, it will be very useful if future studies attempt to operationalise *customer sophistication* and study its potential effects on the nature of relationships and supplier growth potential.

Using the SMM as a focal point, the study has focused downstream the supply chain. Equally important however is managing relationships upstream the supply chain. SMMs may find themselves in supply chains where they have to deal with much larger customers and much larger suppliers. Research in this area is very limited [for an exception see Bates and Slack 1998].

On the other hand, the semi-structured interviews with SMMs provided some interesting observations on the behaviour of SMMs as suppliers to other SMMs. In one case, high levels of interfirm coordination would allow SMMs, to their mutual benefit, to collectively absorb and better respond to demand instability caused by larger firms downstream. In another case, SMMs, were implementing double standards of service in dealing with the focal SMM and with the common, larger customer. Given that SMMs may operate in supply chains designed by their larger customers, autonomous supplier selection becomes an important issue for them. Research into which conditions favour SMMs' cooperation in supply chains would be of great interest, both from a theoretical and a practical point of view.

The operationalisation scheme that was employed has served the needs of a cross-industry study. Similar studies dealing with specific industries should attempt to refine this scheme. For example, SMM's performance relative to competition was measured using self-assessed estimates. In a specific industrial context, objective measurements might also be obtained.

The study adopted the SMM's perspective in addressing the research questions. Undoubtedly, consideration of the customers' perspective would be of interest in exploring some of the more subtle issues referring to the nature of relationships. It would, for example, be interesting to investigate what customers perceive as obstacles in working with SMMs, what they expect from them in terms of service and responsiveness, how they evaluate their relationships with SMMs, and to compare their perspective with that of the SMMs. This would of course require a different unit of analysis and different research design than the one adopted in this study. Such

research however, specifically focused on relationships between SMMs and their customers, would be of value to theory and industrial practice.

As discussed in Chapter 1, this study was sponsored by the Engineering and Marine Training Authority (EMTA), as part of their wider activities in promoting competitiveness of the UK engineering manufacturing industry. In this respect, it is hoped that there are a number of opportunities for EMTA to build upon the findings from this study. The study findings can be of usefulness to the identification of training needs and the design of training programmes that will allow SMMs to develop the skills necessary to successfully implement the relationship management and marketing activities identified here. Assistance to SMMs in managing the transition towards becoming Managers could also be provided. Real-life experience from this can fuel further research in specific areas. Finally, the survey instrument used in this study can be used as the basis for the development of a diagnostic tool aiming to help SMMs assess their strategic choices with regard to their business and the nature of their relationships with customers.

12.11 Summary

The conclusions derived from the study results hopefully represent a useful contribution towards the development of generally applicable theories for the role of SMMs in supply chains. As an empirically driven theory, it bears implications for industrial practice. In this sense, the study conclusions provide guidelines for SMMs that hopefully will help them to better manage their customer relationships. As the focus in operations management gradually shifts from individual companies to the links between them, future research should attempt to validate and refine the study results, and expand the scope of analysis to further investigate linkages between SMMs and other players in supply chains.

REFERENCES

- Abell, D.F. Defining the business: The Starting Point of Strategic Planning, Prentice-Hall, 1980, New Jersey.
- Achrol, S.R., and L.W. Stern "Environmental Determinants of Decision-Making Uncertainty in Marketing Channels" Journal of Marketing Research, vol. XXV, February 1988, pp. 36-50
- Anderson, J. and J. Narus "Partnering as a Focused Market Strategy" California Management Review, vol. 33, no. 3, Spring 1991, pp. 95-113
- Anderson, J. and J. Narus "Capturing the Value of Supplementary Services" Harvard Business Review, January-February 1995, pp.75-85
- Ansoff, H. I., Corporate Strategy, McGraw-Hill, 1965
- Armstrong, J.S. and T.S. Overton "Estimating Nonresponse Bias in Mail Surveys" Journal of Marketing, vol.14, August, 1977, pp.396-402
- Athaide, G.A., P.W. Meyers, and D.L. Wilemon "Seller-Buyer Interactions During the Commercialization of Technological Process Innovations", Journal of Product Innovation Management, vol. 13, 1996, pp.406-421
- Babbie, E. Survey Research Methods, Wadsworth Publishing Company, Belmont, California, 1990
- Bates, H. and N. Slack "What happens when the supply chain manages you? A knowledge-based response" European Journal of Purchasing and Supply Management, vol. 4, 1998, pp. 63-72
- Bhattacharya, A.K., J.L. Coleman, and J. Brace, "Re-positioning the supplier: an SME perspective" Production Planning and Control, vol. 6, no. 3, 1995, pp. 218-226
- Beddowes, P. "Developing Successful Product-Service Strategies", in N.Hart (editor) The Marketing of Industrial Products, 1984, McGraw-Hill, Maidenhead, pp.82-87
- Bellis-Jones, R. (1989) Customer profitability analysis, Management Accounting, February 1989, pp. 26-28
- Bensaou, M. "Interorganisational cooperation: the role of information technology. An empirical comparison of US and Japanese supplier relations" Working Paper 94/68/TM/SM, 1994, INSEAD

- Bensaou, M. and N. Venkatraman, "Configurations of Inter-organisational Relationships: A Comparison Between US and Japanese Automakers" , Working paper 93/55/TM/SM, 1993, INSEAD, Fontainebleau
- Bensaou M. and Venkatraman, "Vertical Relationships and the Role of Information Technology: An Empirical Study of US and Japanese Supplier Relationships in the Auto Industry" Working paper, 95/20/SM/TM, 1995, INSEAD, Fontainebleau
- Bensaou, M. and N. Venkatraman "Not By Partnership Alone: Managing A Portfolio of Relationships" Working Paper 96/30/TM, 1996, INSEAD, Fontainebleau
- Bensaou, M. "Portfolios of Buyer-Supplier Relationships", Sloan Management Review, vol.40, no.4, Summer 1999, pp. 35-44
- Birley, S. and P.Westhead "Growth and Performance Contrasts Between 'Types' of Small Firms" Strategic Management Journal, vol.11, 1990, pp.535-557
- Bonoma, T.V. and B.P. Shapiro Segmenting the Industrial Market Lexington Books, 1983
- Bonoma, T.V. "Major sales: Who really does the buying?" Harvard Business Review, May-June 1982, pp. 111-119
- Bonoma, T.V., Managing Marketing: Text, Cases, and Readings , The Free Press, New York, 1984
- Bozarth C. and S. Edwards "The impact of market requirements focus and manufacturing characteristics focus on plant performance" Journal of Operations Management, vol.15, 1997, pp. 161-180
- Brooksbank, R., D. A. Kirby and G. Wright "Marketing and Company Performance: An Examination of Medium Sized Manufacturing Firms in Britain" Small Business Economics, vol. 4, 1992, pp. 221-236
- Cagliano, R., C. Voss and K. Blackmon "Small firms under microscope: international differences in production/operations management practices & performance" Proceedings of the 6th European Operations Management Association Conference, Venice, Italy, 1999, pp.497-504
- Campbell, N.C.G., and M.T. Cunningham, "Customer Analysis for Strategy Development in Industrial Markets", Strategic Management Journal, vol. 4, 1983, pp. 369-380

- Campbell, N.C.G. "An Interaction Approach to Organisational Buying Behaviour", Journal of Business Research, vol.13, no. 1, 1985, pp.35-48
- Cespedes, F. Concurrent Marketing. Integrating Product, Sales, and Service, Harvard Business School Press, Boston, Massachusetts, 1995
- Chappell, L. "Suppliers disagree on industry trends: the number of suppliers is expected to shrink over the next 10 years", Automotive News Europe, July 6, 1998, p.6
- Chase, R.B. and D.A. Garvin, The Service Factory, Harvard Business Review, July-August, 1989, pp. 61-69
- Chaston, I. "Evolving "New Marketing" Philosophies By Merging Existing Concepts: Application of Process Within Small High-Technology Firms" Journal of Marketing Management, vol.14, 1998, pp.273-291
- Chittenden, F. and R. Bragg, "Trade credit, cash-flow and SMEs in the UK, Germany and France", International Small Business Journal, vol. 16, no.1, 1997, pp.28-34
- Choi, T.Y. and J. L.Hartley "An exploration of supplier selection practices across the supply chain" Journal of Operations Management, vol. 14, 1996 pp. 333-343
- Christopher, M. Logistics and Supply Chain Management. Strategies for Reducing costs and Improving Services, 1992, Pitman, London.
- Cohen, J. and P. Cohen Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences, 1983, Lawrence Erlbaum Associates, Publishers, Hillsdale, New Jersey
- Comer, J.M. and B.J. Zirger "Building a Supplier-Customer Relationship Using Joint New Product Development" Industrial Marketing Management, vol. 26, no.2, March 1997, pp. 203-212
- Cooper, M., and J.T. Gardner "Building Good Business Relationships-More than Just Partnering or Strategic Alliances?" International Journal of Physical Distribution and Logistics Management, vol. 23, no. 6 (1993) pp. 14-26
- Cronin, J., T.L. Baker and J.M. Hawes "An Assessment of the Role Performance Measurement of Power-Dependency in Marketing Channels" Journal of Business Research, vol. 30, 1994, pp. 201-210

- Cunningham, M.T. and E. Homse "Controlling the Marketing-Purchasing Interface: Resource Development and Organisational Implications" Industrial Marketing and Purchasing, vol.1, no.2, 1986, pp.3-27
- De Rose, L.J. "Meet Today's Buying Influences With Value Selling", Industrial Marketing Management, vol. 20, no.2, May 1991, pp. 87-90
- Dixon, L. and A. M. Porter, JIT II. Revolution in Buying and Selling. Purchasing Magazine 1994
- Dowling, G.R. and M. Uncles "Do Customer Loyalty Programs Really Work?" Sloan Management Review, Summer 1997, pp. 71-82
- DTI, "Logistics and supply chain management", Managing in the 90's Programme, DTI
- DTI, "Building a purchasing strategy", Managing in the 90's Programme, DTI
- DTI, "Getting the best from your supply partners" Managing in the 90's Programme, DTI
- DTI, "Efficiency and value in purchasing and supply", Managing in the 90's Programme, DTI
- DTI, "Supplying the challenge", Managing in the 90's Programme, DTI
- Dudick, T.S. "Why SG&A doesn't always work" Harvard Business Review, vol. 65, no.1, January-February 1987, pp. 30-36
- Dwyer, R.F. "Developing Buyer-Seller relationships" Journal of Marketing, vol. 51, April 1987, p. 11-27
- Dyer, J.H. "Specialised supplier networks as a source of competitive advantage: evidence from the auto industry" Strategic Management Journal, vol. 17, 1996, pp.271-291
- Eassom, M., D. Link and T.S. Baines "Some barriers to strategic change in traditional small manufacturing enterprises" Proceedings of the 5th International Conference of the European Operations Management Association, Dublin, Ireland, June 14-17, 1998, pp. 171-176
- Economist, "The corporate-growth puzzle" July 17th 1999, pp.96
- El-Ansary A.I and L.Stern "Power Measurement in the Distribution Channel" Journal of Marketing Research, vol.9, February 1972, pp.47-52
- Ellram L., and Hendrick T., "Partnership Characteristics: A Dyadic Perspective" Journal of Business Logistics vol. 16, no.1 1995, pp. 41-64

EMTA, 1998 Labour Market Survey of the Engineering Industry in Britain. Interim Report, Engineering and Marine Training Authority, Training Publications Ltd, Watford, 1998.

ESRC Centre for Business Research, The Changing State of British Enterprise. Growth, Innovation and Competitive Advantage in Small and Medium sized Firms 1986-95, Cosh, A. and A. Hughes(editors), University of Cambridge, 1996

Fiocca, R. "Account Portfolio Analysis for Strategy Development" Industrial Marketing Management, vol. 11, no. 1, 1982, pp. 53-62

Fisher, M.L "Effective supply chains" Harvard Business Review, March-April 1997, pp.105-117

Flynn, J., "Startups to the Rescue", Business Week, March 23, 1998, pp.50-52

Forrester J.W. Industrial Dynamics MIT Press, Cambridge, Mass. 1961

Forza, C. "Achieving superior operating performance from integrated pipeline management: an empirical study" International Journal of Physical Distribution & Logistics Management, vol. 26, no. 9, 1996, pp. 36-63

Frazier, G.L., R.E. Spekman and C.R. O'Neal "Just-In-Time Exchange Relationships in Industrial Markets", Journal of Marketing, vol. 52, October 1988, pp. 52-67

Frazier, G.L. "On the Measurement of Interfirm Power in Channels of Distribution", Journal of Marketing Research, vol. 20, May 1983, pp.158-166

Geroski, P. "The Growth of Firms in Theory and in Practice", CERP discussion paper, London Business School, March 1999

Gill, J. and P. Johnson Research Methods for Managers, Paul Chapman Publishing, London, 1991

Graham, T.S., P.J. Daugherty, and W.N. Dudley " The Long-Term Strategic Impact of Purchasing Partnerships" International Journal of Purchasing and Materials Management, vol. 30, no.4, 1994, pp.12-18

Hair, J.F. Jr, R.E. Anderson, R.L. Tatham and W.C. Black, Multivariate data analysis, 1998, Prentice Hall, New Jersey.

Hakansson, H. J. Johanson and B. Wootz, "Influence Tactics in Buyer-Seller Processes", in F. David (editor) Understanding Business Markets, The Dryden Press, 1997, London

- Harrison A. "The impact of schedule stability on supplier responsiveness: A comparative study" Proceedings of the 2nd International Symposium on Logistics, pp. 217-224, 11-12 July 1995, University of Nottingham
- Hart, N. (editor) The Marketing of Industrial Products, McGraw-Hill Ltd, 1984
- Hartley, J.L. and T.Y. Choi "Supplier Development: Customers As A Catalyst Of Process Change" Business Horizons, July-August 1996
- Heide, J.B. "Interorganisational Governance in Marketing Channels" Journal of Marketing, vol. 58, January 1994, pp. 71-85
- Heide, J. and John G., "Alliances in Industrial Purchasing: The Determinants of Joint Action in Buyer-Supplier Relationships", Journal of Marketing Research, vol.27, no. 2, 1990, pp. 24-36
- Helper, S. and M. Sako "Supplier relations in Japan and the United States: are they converging?" Sloan Management Review, Spring 1995, pp.77-84
- Heskett, J.L., W.E. Sasser, Jr. and C.W.L. Hart Service Breakthroughs. Changing the Rules of the Game, The Free Press, 1990
- Heskett, J.L., T.O. Jones, G.W. Loveman, W. E. Sasser, Jr. and L.A. Schlesinger "Putting the Service-Profit Chain to Work" Harvard Business Review, March-April 1994, pp.164-174
- Hill, T. Manufacturing Strategy: Text and Cases, Irwin.1989
- Holmlund, M and S. Kock "Buyer-Dominated Relationships in a Supply Chain-A Case Study of Four Small Suppliers", International Small Business Journal, October-December 1996, pp.26-40
- IMP Project Group International Marketing and Purchasing of Industrial Goods, Hakansson H.(editor) University of Uppsala 1982
- Jackson, B.B., Winning and Keeping Industrial Customers, Lexington, Mass.:D.C. Heath, 1985
- Jaworski, B.J. and A.K. Kohli "Market Orientation: Antecedents and Consequences" Journal of Marketing, vol.57 no.3 July 1993, pp. 53-70
- Johanson, J. Production technology and user-supplier interaction, in International Marketing and Purchasing of Industrial Goods: An Interaction Approach, IMP Group, H.Hakansson (editor), John Wiley & Sons, 1982, pp. 316-323

- Johnston, W.J. and J.E. Lewin "Organisational Buying Behavior: Toward an Integrative Framework" Journal of Business Research vol.35, no.1, January 1996, pp. 1-16
- Kalwani, M.U. and N. Narayandas "Long-Term Manufacturer-Supplier Relationships: Do They Pay Off for Supplier Firms?" Journal of Marketing, January 1995, pp. 1-16
- Kaplan, R.S. "Kanthal (A) and (B) Teaching Note" Harvard Business School Case Study (#5-190-115), Rev. September 28, 1994
- Karlsson, C. and Par Ahlstrom "A lean and global smaller firm?" International Journal of Operations & Production Management, Number 10, 1997, pp. 940-952
- Kearney A.T. *Partnership or Power Play?* 1994
- Kotler, P. Marketing management: analysis, planning, implementation and control, 1994, Prentice Hall, New Jersey
- Krapfel, R.E. Jr., D. Salmond and R. Spekman "A Strategic approach to Managing Buyer-Seller Relationships" European Journal of Marketing, vol. 25, no. 9, 1991, pp. 22-37
- Krause, D.R., and L.M. Ellram "Supplier Development: Current Practices" Proceedings of the First Worldwide Research symposium on Purchasing and Supply Chain Management, University of Arizona, 1995, pp.384-394
- Kwaku Atuahene-Gima "Market Orientation and Innovation", Journal of Business Research, vol.35, 1996, pp.93-103
- La Londe, B.J. and Masters, J.M. "Logistics Strategies for the USA" in Logistics and Distribution Planning, J. Cooper (editor), Kogan Page Ltd, London, 1994
- Lamming, R. Beyond Partnership: Strategies for innovation and lean supply, 1993, Prentice Hall, New York
- Lamming, R.C. "Five Years On: How is Lean Supply Doing?" Proceedings of the First Worldwide Research Symposium on Purchasing and Supply Chain Management, March 23-25, 1995, Tempe, Arizona, pp. 122-132
- Lee, H.L., V. Padmanabhan and S. Whang "The Bullwhip effect in Supply Chains" Sloan Management Review, Spring 1997, pp. 93-102
- Leuthesser, L. and A.K. Kohli "Relational Behaviour in Business Markets. Implications for Relationship Management" Journal of Business Research, vol. 34, 1995, pp.221-233

Leverick, F. and R. Cooper "Partnerships in the Motor Industry: Opportunities and Risks for Suppliers" Long Range Planning, vol.31, Issue 1, February 1998, pp.72-81

Levitt, T.(b) Marketing Success Through Differentiation-of Anything in Strategic Marketing Management, Dolan R.J. (Editor), pp. 194-207, Harvard Business School Publications, 1991, Boston, Massachusetts

Lieberman, M.B., S. Helper and L. Demeester "The empirical determinants of inventory levels in High-volume manufacturing" Production and Operations Management, vol. 8, no.1, Spring 1999, pp.44 -55

Lyons B.R. and S. Bailey "Small Subcontractors in UK Engineering: Competitiveness, Dependence and Problems" Small Business Economics, vol. 5, 1993, pp.101-109

Madsen, T.K. "Successful Export Marketing Management: Some Empirical Evidence" International Marketing Review, vol.6, no.4, 1989, pp.41-57

Management Accounting, "It's time to change the payment culture", Management Accounting, vol.76, no.11, 1998, p.28

Manchester Manufacturing Management Center "Manufacturing Practices in New Hampshire, Survey 1993-1994" Whittemore School of Business and Economics, University of New Hampshire, 1994, US.

Miesenbock, K.J. "Small Businesses and Exporting: A Literature Review", International Small Business Journal, vol.6, no.2, January-March, 1988, pp.42-61

Monczka, R.M., T.J. Callahan and E.L. Nichols "Predictors of relationships among buying and supplying firms" International Journal of Physical Distribution and Logistics Management, vol. 25, no. 10, 1995, pp.45-59

Narver, J.C. and Slater, S.F. The Effect of Market Orientation on Business Profitability, Journal of Marketing, vol. 54, no.4, October 1990, pp. 20-35

Neuman, W.L., Social Research Methods, Allyn and Bacon, Massachusetts, 1991

New, S.J. "A framework for analysing supply chain improvement" International Journal of Operations and Production Management , vol. 16, no. 4, 1996 pp. 19-34

New, S.J. and I. Mitropoulos "Strategic networks: morphology, epistemology and praxis" International Journal of Operations and Production Management, vol. 15 no.11, 1995, pp. 53-61

- New, S and B. Burnes "Supply Chain Integration: Results from a Mixed-Method Pilot Study" Manufacturing and Production Procurement, IPSERA 4th International Annual Conference, University of Birmingham, 11-12 April 1995.
- Nielson, C.C. "An empirical examination of the role of "closeness" in industrial buyer-seller relationships" European Journal of Marketing, vol.32, no. 5/6, 1998, pp.441-463
- Noordewier, T.G., G. John and J.R. Nevin "Performance Outcomes of Purchasing Arrangements in Industrial Buyer-Vendor Relationships" Journal of Marketing, October 1990, pp. 80-93
- Nunnally, J. Psychometric Theory, McGraw Hill, New York, 1978
- O' Brien, P. and P. Walley "How HRC quietly professionalized" Small Business and Enterprise Development, vol. 2, 1995, pp. 31-39
- Paterson, W. "Public Relations" in N. Hart (editor) The Marketing of Industrial Products, McGraw-Hill, Maidenhead, 1984, pp.72-80
- Pelham, A.M. and D.T. Wilson "Does Market Orientation Matter for Small Firms?" Working Paper, Marketing Science Institute, Report no. 95-102, April 1995
- Pettitt, S.J. "Small Firms and their Major Customers: An Interaction and Relationship Approach" PhD Dissertation, Cranfield School of Management, September 1992
- Reichheld, F.F. "Loyalty-based management" Harvard Business Review, March-April 1993, pp. 64-74
- Reid, R.D. and N.R. Sanders "Competitive priorities and the manufacturer-supplier relationship : survey results" Working Paper, Whittemore School of Business and Economics, University of New Hampshire, January 1998
- Sako, M., R. Lamming and S.R. Helper "Supplier relations in the UK car industry: good news-bad news" European Journal of Purchasing and Supply Management, vol. 1, no. 4, 1994, pp. 237-248
- Schrunder, C.L. and R. Mudambi "Progress towards Buyer-Supplier Partnerships - Evidence from Small and Medium Manufacturing Firms", Manufacturing and Production Procurement, Proceedings of the IPSERA 4th International Annual Conference, University of Birmingham, 11-12 April 1995.
- Skinner, W. "The focused factory" Harvard Business Review, May-June 1974, pp. 113-121

- Skinner, W. "Manufacturing-missing link in corporate strategy" Harvard Business Review, May-June 1969, pp. 136-145
- Souder, W.E. and X.M. Song "Contingent Product Design and Marketing Strategies Influencing New Product Success and Failure in US and Japanese Electronics Firms", Journal of Product Innovation Management, vol.14, no.1, (January) 1997, pp.21-34
- Shapiro, B.P. "What the Hell Is 'Market Oriented'" Harvard Business Review, 66, no.6, 1988, pp.119-125
- Shapiro, B.P., V.K. Rangan, R.T. Moriarty, and E.B.Boss "Manage customers for profits(not just sales)" Harvard Business Review, vol. 65, no. 5, September-October 1987, pp. 101-108
- Shapiro, B.P. 'Close Encounters of the Four Kinds: Managing Customers in a Rapidly Changing Environment' in Strategic Marketing Management, Dolan R.J. (Editor), pp. 429-456, Harvard Business School Publications, 1991, Boston, Massachusetts
- Smallbone, D., D. North and R. Leigh, Managing change for growth and survival: a study of mature manufacturing firms in London during the 1980s" ESRC Small Business Research Initiative, Middlesex Polytechnic Working Paper no.3, 1992
- Sprague, L.G., B. Munoz-Seca and J. Riverola "A diagnostic tool for the Small-to Medium-sized Manufacturer: Strategy Development through Analysis of Current Operations" Proceedings of the Fourth International Meeting of the Decision Sciences Institute, Sydney, Australia (1997)
- Stalk, G. and T. Hout Competing against time. How Time-based Competition Is Reshaping Global Markets, the Free Press 1990
- Storey, D. and P. Morgan, The Ten Percenters. Third Report, Fast Growing SMEs in Great Britain, Deloitte & Touche, 1998
- Storey, D.J. Understanding the Small Business Sector, Routledge, 1994
- Stuart, F. I., D. M. McCutcheon and R.A. Grant "Strategic Supplier Alliances and Information Exchanges: Process and Content" Proceedings of the First Worldwide Research Symposium on Purchasing and Supply Chain Management, March 23-25, 1995, Tempe, Arizona, pp. 227-238

- Stuart, F.I. "Supplier alliance success and failure: a longitudinal dyadic perspective" International Journal of Operations and Production Management, vol. 17, nos. 5 and 6, 1997, pp. 539-557
- Stuart, F.I and D. McCutcheon "Sustaining strategic supplier alliances: profiling the dynamic requirements for continued development" International Journal of Operations and Production Management, vol.16, no.10, 1996, pp.5-22
- Stump, R.L. and V. Sriram 'Employing Information Technology in Purchasing: Buyer-Supplier Relationships and Size of the Supplier Base' Industrial Marketing Management, vol. 26, 1997, pp. 127-136
- Styles C. and T. Ambler "Successful Export Practice: the UK experience" International Marketing Review, vol.11, no.6, 1994
- Szeinbach, S.L., J.H. Barnes, and D.D. Garner "Use of Pharmaceutical Manufacturers' Value-Added Services to Build Customer Loyalty", Journal of Business Research, vol. 40, 1997, pp.229-236
- Szymankiewicz, J. "Supply-Chain Partnerships, Who Wins?" Logistics Focus, vol.2, no.10, 1994, pp.8-11
- Tabachnick G.B. and L.S. Fizzell Using multivariate statistics, 1989, Harper Collins Publishers, New York
- The Sunday Times, Price Waterhouse Coopers, Mercury Asset Management, "Fast Track 100: Britain's 100 fastest-growing companies", The Sunday Times, 6 December 1998
- Terazono, E. "Late Payments: Small companies may now have the option to charge interest on debts, but few are likely to do so", Financial Times, 19 March 1999
- Turnbull, P., R. Delbridge, N. Oliver and B. Wilkinson "Winners and Losers-the 'Tiering' of Component Suppliers in the UK Automotive Industry", Journal of General Management, vol. 19 no.1 1993, pp. 48-63
- Turnbull, P.W. and Cunningham, M.T. International Marketing and Purchasing: A Survey of Attitudes of Marketing and Purchasing Executives in five European Countries. 1981, Macmillan, London.
- Turnbull, P. "A Review of Portfolio Planning Models for Industrial Marketing and Purchasing Management", European Journal of Marketing, vol. 24, no. 3, 1990, pp. 7-22

- Turok, I. "Which small firms grow?" in Davies, L.G and A.A. Gibb (editors) Recent Research in Entrepreneurship, 1991, Avebury Gower Publishing Company Limited, Aldershot
- Verma, R. and J.C. Goodale "Statistical power in operations management research" Journal of Operations Management, vol.13, no.2, 1995, pp.139-152
- Voss, C., K. L. Blackmon, R. Cagliano, P.Hanson and F. Wilson "Made in Europe: Small Companies" Business Strategy Review, vol. 9, issue 4, 1998, pp.1-19
- Voss, C. "Applying Service Concepts in Manufacturing", International Journal of Operations and Production Management, vol. 12, no.4, 1992, pp.93-99
- Wacker, J.G. and L.G. Sprague, "Forecasting accuracy: comparing the relative effectiveness of practices between seven developed countries" Journal of Operations Management, vol.16, 1998, pp.271-290
- Waters-Fuller, N. "The benefits and costs of JIT sourcing: a study of Scottish suppliers" International Journal of Physical Distribution and Logistics Management, vol. 26, no. 4, 1996, pp. 35-50
- Webster, F.E. Market-driven management.Using the new marketing concept to create a customer-oriented company, 1994, Wiley, New York
- Webster, M., A. Muhlemann, and C. Alder "Subcontract manufacture in the electronics assembly industry-cases of industrial practice", Proceedings of the 5th International Conference of the European Operations Management Association, Dublin, Ireland, June 14-17, 1998, pp. 562-567
- Wijewardena, H. and G.E. Tibbits,"Factors Contributing to the Growth of Small Manufacturing Firms: Data from Australia" Journal of Small Business Management, vol.37, no.2, April, 1999, pp.88-95
- Wood, C.H, A. Kaufman and M. Merenda "How HADCO became a problem-solving supplier" Sloan Management Review, vol.37, no.2, 1996, pp.77-88
- Yap, C.M. and W.E. Souder "Factors Influencing New Product Success and Failure in Small Entrepreneurial High-Technology Electronics Firms" The Journal of Product Innovation Management, vol.11, no.5, November 1994, pp.418-432

BIBLIOGRAPHY

- Abell, D.F. Defining the business: The Starting Point of Strategic Planning, Prentice-Hall, 1980, New Jersey.
- Achrol, S.R., and L.W. Stern "Environmental Determinants of Decision-Making Uncertainty in Marketing Channels" Journal of Marketing Research, Vol. XXV, February 1988, pp. 36-50
- Anderson, J. and J. Narus "Partnering as a Focused Market Strategy" California Management Review, Vol. 33, No. 3, Spring 1991, pp. 95-113
- Anderson, J. and J. Narus "Capturing the Value of Supplementary Services" Harvard Business Review, January-February 1995, pp 75-85
- Ansoff, H. I., Corporate Strategy, McGraw-Hill, 1965
- Anterasian, C. and L.W. Phillips, Discontinuities, value delivery, and the share-returns association: A re-examination of the 'share-causes-profits' controversy, Research Program Monograph, Report No. 88-109, Cambridge, MA: Marketing Science Institute, October 1988
- Anton, J. Customer relationship management: making hard decisions with soft numbers, 1996, Prentice Hall
- Aoki, M., B. Gustafsson and O.E. Williamson (editors) The Firm as a Nexus of Treaties, 1990, Sage Publications, London.
- Armstrong, J.S. and T.S. Overton "Estimating Nonresponse Bias in Mail Surveys" Journal of Marketing, vol.14, August, 1977, pp. 396-402
- Athaide, G.A., P.W. Meyers, and D.L. Wilemon "Seller-Buyer Interactions During the Commercialization of Technological Process Innovations", Journal of Product Innovation Management, Vol. 13, 1996, pp.406-421
- Audretsch D.B., "Innovation, growth and survival", International Journal of Industrial Organisation, Vol.13, no.4, 1995, pp.441-457
- Babbie, E. Survey Research Methods, Wadsworth Publishing company, Belmont, California, 1990
- Bates, H. and N. Slack "What happens when the supply chain manages you? A knowledge-based response" European Journal of Purchasing and Supply Management, vol. 4, 1998, pp. 63-72

- Beddowes, P. "Developing Successful Product-Service Strategies", in N.Hart (editor) The Marketing of Industrial Products, 1984, McGraw-Hill, Maidenhead, pp.82-87
- Bellis-Jones, R. (1989) Customer profitability analysis, Management Accounting, February 1989, pp. 26-28
- Bennett, D. Action Research into Market Development in the Independent Growth Firm, Durham University Business School, Occasional Paper 9177, 1991
- Bensaou, M. "Interorganisational cooperation: the role of information technology. An empirical comparison of US and Japanese supplier relations" Working Paper 94/68/TM/SM, 1994, INSEAD
- Bensaou, M. and N. Venkatraman, "Configurations of Inter-organisational Relationships: A Comparison Between US and Japanese Automakers" , Working paper 93/55/TM/SM, 1993, INSEAD
- Bensaou M. and Venkatraman, "Vertical Relationships and the Role of Information Technology: An Empirical Study of US and Japanese Supplier Relationships in the Auto Industry" Working paper, 95/20/SM/TM, 1995, INSEAD
- Bensaou, M. and E. Anderson "Buyer-Supplier Relations in Industrial Markets: When Do Buyers Enter the Trap of Making Idiosyncratic Investments?", Working Paper 97/27/TM/MKT, 1997, INSEAD, Fontainebleau
- Bensaou, M. and N. Venkatraman "Not By Partnership Alone: Managing A Portfolio of Relationships" Working Paper 96/30/TM, 1996, INSEAD, Fontainebleau
- Bensaou, M. "Portfolios of Buyer-Supplier Relationships", Sloan Management Review, vol.40, no.4, Summer 1999, pp. 35-44
- Berry, D. and M.M. Naim "A systems engineering analysis of information and material flows in a manufacturing company" Proceedings IEE Factory 2000 Conference, 1994, pp. 138-145
- Bhattacharya, A.K., J.L. Coleman, and J. Brace, "Re-positioning the supplier: an SME perspective" Production Planning and Control, Vol. 6, No. 3, 1995, pp. 218-226
- Birley, S. and P. Westhead "Growth and Performance Contrasts Between 'Types' of Small Firms" Strategic Management Journal, Vol.11, 1990, pp.535-557
- Blattberg R.C. and J. Deighton "Manage Marketing by the Customer Equity Test", Harvard Business Review, July-August 1996, pp. 136-144

- Bonoma, T.V. and B.P. Shapiro Segmenting the Industrial Market Lexington Books, 1983
- Bonoma, T.V. "Major sales: Who really does the buying?" Harvard Business Review, May-June 1982, pp. 111-119
- Bonoma, T.V., Managing Marketing: Text, Cases, and Readings , The Free Press, New York, 1984
- Bowersox, D.J and P.J. Daugherty "Logistics paradigms: the impact of information technology" Journal of Business Logistics, Vol. 16, No. 1, 1995, pp.65-80
- Bozarth C. and S. Edwards "The impact of market requirements focus and manufacturing characteristics focus on plant performance" Journal of Operations Management, vol.15, 1997, pp. 161-180
- Brooksbank, R., D. A. Kirby and G. Wright "Marketing and Company Performance: An Examination of Medium Sized Manufacturing Firms in Britain" Small Business Economics, Vol. 4, 1992, pp. 221-236
- Brown, S.L.and K.M. Eisenhardt, "Product Development: Past Research, Present Findings, and Future Directions", The Academy of Management Review, vol.20, no.2, (April) 1995, pp. 343-378
- Butheway, A. Information in the Supply Chain: Measuring Supply Chain Performance, Working Paper, SWP 1/95, Cranfield School of Management, Cranfield University, 1995
- Cagliano, R., C. Voss and K. Blackmon "Small firms under microscope: international differences in production/operations management practices & performance" Proceedings of the 6th European Operations Management Association Conference, Venice, Italy, 1999, pp.497-504
- Campbell, A. and K.S. Luchs Strategic Synergy, Butterworth-Heinemann Ltd, 1992
- Campbell, A. J. "The Effect of Fast Market Responsiveness on Supply Partnerships", Working Paper, Report No. 95-112, Marketing Science Institute, October 1995
- Campbell, N.C.G., and M.T. Cunningham, "Customer Analysis for Strategy Development in Industrial Markets", Strategic Management Journal, Vol. 4, 1983, pp. 369-380

- Campbell, N.C.G. "An Interaction Approach to Organisational Buying Behaviour", Journal of Business Research, vol.13, no. 1, 1985, pp.35-48
- Carrie, A.S., R. Macintosh, A. Scott and G.A. Peoples "Linking strategy to production management structures and systems" International Journal of Production Economics, Vol. 34, No. 3, June 1994, pp.293-304
- Cavinato, J.L. "A Total Cost/Value Model for Supply Chain Competitiveness" Journal of Business Logistics, Vol. 13, No. 2, (1992) pp. 285-301
- Cespedes, F. Concurrent Marketing. Integrating Product, Sales, and Service, Harvard Business School Press, Boston, Massachusetts, 1995
- Chappell, L. "Suppliers disagree on industry trends: the number of suppliers is expected to shrink over the next 10 years", Automotive News Europe, July 6, 1998, p.6
- Chase, R.B. and D.A. Garvin, The Service Factory, Harvard Business Review, July-August, 1989, pp. 61-69
- Chaston, I. "Evolving "New Marketing" Philosophies By Merging Existing Concepts: Application of Process Within Small High-Technology Firms" Journal of Marketing Management, vol.14, 1998, pp.273-291
- Chaston, I. and T. Mangles "Core Capabilities as Predictors of Growth Potential in Small Manufacturing Firms" Journal of Small Business Management, Vol. 35, No.1, January 1997, pp. 47-57
- Chikan, A. "Supplier Relations and Internal Organisations" Proceedings of the 4th IPSERA International Annual Conference, 11-12 April 1995, University of Birmingham.
- Chittenden, F. and R. Bragg, "Trade credit, cash-flow and SMEs in the UK, Germany and France", International Small Business Journal, vol. 16, no.1, 1997, pp.28-34
- Choi, T.Y. and J. L.Hartley "An exploration of supplier selection practices across the supply chain" Journal of Operations Management, Vol. 14, 1996 pp. 333-343
- Christopher, M. Logistics and Supply Chain Management. Strategies for Reducing costs and Improving Services, 1992, Pitman, London.
- Christy, D.P. and J.R. Grout "Safeguarding supply chain relationships", International Journal of Production Economics, Vol. 36, No.3, October 1994, pp.233-242

- Clark, T., P.R. Varadarajan and W. Pride "Environmental Management: The Construct and Research Propositions" Journal of Business Research Vol. 29, 1994, pp. 23-38
- Clark, K.B. and T. Fujimoto "The Power of Product Integrity" Harvard Business Review, November-December 1990, pp. 107-118
- Cohen, J. and P. Cohen Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences, 1983, Lawrence Erlbaum Associates, Publishers, Hillsdale, New Jersey
- Comer, J.M. and B.J. Zirger "Building a Supplier-Customer Relationship Using Joint New Product Development" Industrial Marketing Management, Vol. 26 No.2 march 1997, pp. 203-212
- Cooper,J.(editor) Logistics and Distribution Planning. Strategies for Management. 1994, Kogan Page
- Cooper, M., and J.T. Gardner "Building Good Business Relationships-More than Just Partnering or Strategic Alliances?" International Journal of Physical Distribution and Logistics Management, Vol. 23, No. 6 (1993) pp. 14-26
- Cooper, R. and T. Yoshikawa "Inter-organisational cost management systems: the case of the Tokyo-Yokohama-Kamakura supplier chain", International Journal of Production Economics, Vol. 37, No. 1, November 1994, pp. 51-62
- Coopers & Lybrand "Made in the UK: The Middle Market Survey", 1994, Coopers & Lybrand, London.
- Corey, E.R. Industrial marketing: cases and concepts, third edition, Prentice Hall, New Jersey, 1983
- Correa, H. L. Linking Flexibility, Uncertainty, and Variability in Manufacturing Systems, Avebury, 1994
- Cronin, J., T.L. Baker and J.M. Hawes "An Assessment of the Role Performance Measurement of Power-Dependency in Marketing Channels" Journal of Business Research, Vol. 30, 1994, pp. 201-210
- Croom-Morgan, S. "Competitive Advantage Through Effective Purchasing: The Strategic Management of Supplier Interaction" Proceedings for the First Worldwide Research Symposium on Purchasing and Supply Chain Management, March 23-25, 1995, Tempe, Arizona, pp. 240-251

Croom-Morgan, S. and M. Saunders "Supply Chain Competitive Criteria: A Conceptual View of the Interaction, Interdependence and Integration of Supply Chains" Proceedings of the 4th IPSEIA International Annual Conference, 11-12 April 1995, University of Birmingham.

Cunningham, M.T. "An Interaction Approach to Purchasing Strategy", in Hakansson, H. (Ed.) International Marketing and Purchasing of Industrial Goods, Wiley, Chichester, 1982

Cunningham, M.T. and E. Homse "Controlling the Marketing-Purchasing Interface: Resource Development and Organisational Implications" Industrial Marketing and Purchasing, vol.1, no.2, 1986, pp.3-27

Cusumano, A.M. "The Limits of "Lean"", Sloan Management Review, Summer 1994, pp. 27-32

Daugherty, P.J. and M.S. Spencer "Just-in-Time Concepts: Applicability to Logistics/Transportation" International Journal of Physical Distribution & Logistics Management, Vol. 20, No. 7, 1990, pp. 12-17

Davig, W. and S. Brown "Incremental Decision Making in Small Manufacturing Firms" Journal of Small Business Management, Vol. 30, No.2, April 1992, pp. 53-60

Day, G.S. The Capabilities of Market-Driven Organizations, Marketing Science Institute, Report Number 93-123, December 1993

De Rose, L.J. "Meet Today's Buying Influences With Value Selling", Industrial Marketing Management, Vol. 20, No.2, May 1991, pp. 87-90

Deshpande, R. and J.U. Farley "Understanding Market Orientation: A Prospectively Designed Meta-analysis of Three Market Orientation Scales", Working Paper, Report No. 96-125, December 1996

Dixon, L. and A. M. Porter, JIT II. Revolution in Buying and Selling. Purchasing Magazine 1994

Doi, N. "The efficiency of small manufacturing firms in Japan", Small Business Economics, vol.4, no.1, 1992, pp.29-35

Donaldson, B. The competitive dimensions of customer service in manufacturing industry, Department of Marketing, Working Paper Series, 94/4, University of Strathclyde, 1994

- Dowling, G.R. and M. Uncles "Do Customer Loyalty Programs Really Work?" Sloan Management Review, Summer 1997, pp. 71-82
- DTI "Logistics and supply chain management", Managing in the 90's.
- DTI "Building a purchasing strategy", Managing in the 90's
- DTI "Getting the best from your supply partners" Managing in the 90's
- DTI "Efficiency and value in purchasing and supply", Managing in the 90's
- DTI "Supplying the challenge", Managing in the 90's
- Dubinsky, A.J. and T.N. Ingram "A Portfolio Approach to Account Profitability" Industrial Marketing Management, Vol. 13, 1984, pp. 33-41
- Dudick, T.S. "Why SG&A doesn't always work" Harvard Business Review, Vol. 65, No.1, January-February 1987, pp. 30-36
- Dwyer, R.F. "Developing Buyer-Seller relationships" Journal of Marketing, Vol. 51, April 1987, p. 11-27
- Dwyer, R. F. and M. A. Welsch "Environmental Relationships of the Internal Political Economy of Marketing Channels" Journal of Marketing Research, Vol. XXII November 1985, pp. 397-414
- Dyer, J.H. "Specialised supplier networks as a source of competitive advantage: evidence from the auto industry" Strategic Management Journal, Vol. 17, 1996, pp.271-291
- Dyer, J.H. and W. G. Ouchi "Japanese-Style Partnerships: Giving Companies a Competitive Edge" Sloan Management Review, Fall 1993
- Dyer, J.H. "Dedicated Assets: Japan's Manufacturing Edge" Harvard Business Review, November-December 1994, pp. 174-178
- Eassom, M., D. Link and T.S. Baines "Some barriers to strategic change in traditional small manufacturing enterprises" Proceedings of the 5th International Conference of the European Operations Management Association, Dublin, Ireland, June 14-17, 1998, pp. 171-176
- Economist, "The corporate-growth puzzle" July 17th 1999, pp.96
- Eisenhardt, K.M. and B.N. Tabrizi "Accelerating Adaptive Processes: Product Innovation in the Global Computer Industry", Administrative Science Quarterly, vol.40, no.1, 1995, pp.84-110

- El-Ansary A.I and L.Stern "Power Measurement in the Distribution Channel" Journal of Marketing Research, vol.9, February 1972, pp.47-52
- Ellram, L. "Supply Chain Management: The Industrial Organisation Perspective", International Journal of Physical Distribution & Logistics Management Vol. 21, No. 1, 1991, pp.12-22
- Ellram L., and Hendrick T., "Partnership Characteristics: A Dyadic Perspective" Journal of Business Logistics Vol. 16, No.1 1995, pp. 41-64
- Eloranta E. "Fast, flexible and co-operative supply chains-key issues for the survival of European industry" Production Planning and Control, Vol. 6, No. 3, Special Issue: Supply-Chain-Management, May-June 1995
- EMTA, 1998 Labour Market Survey of the Engineering Industry in Britain. Interim Report, Engineering and Marine Training Authority, Training Publications Ltd, Watford, 1998.
- Esposito, E. and M. Raffa "Diffusion of world Class Supply in Italian and French Aircraft Subcontracting Firms" Proceedings for the First Worldwide Research Symposium on Purchasing and Supply Chain Management, March 23-25, 1995, Tempe, Arizona, pp.194-207
- ESRC Centre for Business Research, The Changing State of British Enterprise. Growth, Innovation and Competitive Advantage in Small and Medium sized Firms 1986-95, Cosh, A. and A. Hughes(editors), University of Cambridge, 1996
- Euske, K.J. and R.S. Player "Leveraging Management Improvement Techniques" Sloan Management Review, Fall 1996, pp. 69-80
- Fawcett, S.E. and S.A. Fawcett "The firm as a value added system: Integrating logistics, operations and purchasing" International Journal of Physical distribution and Logistics Management, Vol. 25, No.5, 1995, pp. 24-42
- Feitzinger, E. and H.L. Lee "Mass Customisation at Hewlett-Packard:The Power of Postponement" Harvard Business Review, January-February 1997, pp. 116-123
- Ferdows, K. and A.De Meyer "Lasting Improvements in Manufacturing Performance: In Search of a New Theory" Journal of Operations Management, Vol.9, No.2, April, 1990, pp.168-184

- Ferdows, K., "Generating and Sharing Knowledge in Global Operations Networks", Keynote Address, VI International Annual Conference of the European Operations Management Association, June 7-8, Venice, Italy, 1999
- Fiocca, R. "Account Portfolio Analysis for Strategy Development" Industrial Marketing Management, Vol. 11, no. 1, 1982, pp. 53-62
- Fisher, M.L "Effective supply chains" Harvard Business Review, March-April 1997, pp.105-117
- Fleming, F.C.and J.G. Nellis "Principles of Applied Statistics", Routledge, London, 1994
- Flint, D.J., R. B. Woodruff and Sarah Fisher Gardial "Customer Value Change in Industrial Marketing Relationships: A Call for New Strategies and Research" Industrial Marketing Management, Vol. 26, No.2 1997, pp. 163-175
- Flynn, J., "Startups to the Rescue", Business Week, March 23, 1998, pp.50-52
- Forrester J.W. Industrial Dynamics MIT Press, Cambridge, Mass. 1961
- Forza, C. "Achieving superior operating performance from integrated pipeline management: an empirical study" International Journal of Physical Distribution & Logistics Management, Vol. 26, No. 9, 1996, pp. 36-63
- Foxall, G. "Strategies of Innovation in Smaller Firms: Product Gap Problems and Market Gap Opportunities" Marketing and Logistics Discussion Paper Series, Cranfield School of Management, 86/4, 1986
- Frazier, G.L., R.E. Spekman and C.R. O'Neal "Just-In-Time Exchange Relationships in Industrial Markets", Journal of Marketing, Vol. 52, October 1988, pp. 52-67
- Frazier, G.L. "On the Measurement of Interfirm Power in Channels of Distribution", Journal of Marketing Research, vol. 20, may 1983, pp.158-166
- Fulcher, J. "Customer satisfaction", Manufacturing Systems, January 1997, pp. 66-71
- Fuller, J.B., J. O' Conor and R. Rawlinson "Tailored Logistics: The Next Advantage" Harvard Business Review, May-June 1993
- Ganesan, S. "Determinants of Long-Term Orientation in Buyer-Seller Relationships" Journal of Marketing, Vol. 58, April 1994, p. 1-19
- Ganesan, S. "Negotiation Strategies and the Nature of Channel Relationships", Journal of Marketing Research Vol. XXX, May 1993, pp. 183-203

- Gassenheimer, J. B., J.U. Sterling and R. A. Robicheaux "Long-term channel member relationships" International Journal of Physical Distribution and Logistics Management, Vol. 26, No. 5 1996, pp. 94-116
- Germain, R., C. Droge and P. J. Daugherty "The Effect of Just-in-Time Selling on Organisational Structure: An Empirical Investigation" Journal of Marketing Research, Vol. XXXI, November 1994, pp. 471-483
- Geroski, P.A. "The Growth of firms in Theory and in Practice", CERP Discussine Paper, London Business School, March 1999
- Gerwin, D. "Manufacturing Flexibility: A Strategic Perspective" Management Science, Vol.39, No.4, April 1993, pp. 395-410
- Gibb, A.A. A Study of The Growth of Small Firms, Durham University Business School, Occasional Paper Series 9242
- Gill, J. and P. Johnson Research Methods for Managers, Paul Chapman Publishing, London, 1991
- Gilmore, J.H. and B. Joseph Pine II "The Four Faces of Mass Customisation", Harvard Business Review, January-February 1997, pp. 91-101
- Geroski, P. "The Growth of Firms in Theory and in Practice", CERP discussion paper, March 1999
- Goffin, K. M. Szwejczewski and C. New "Managing suppliers: when fewer can mean more" International Journal of Physical Distribution and Logistics Management, vol.27, no.7/8 , 1997, pp.422-436
- Gopal, C. and G. Cahill Logistics in Manufacturing, Business One Irwin: Homewood, IL,1992
- Graham, T.S., P.J. Daugherty, and W.N. Dudley " The Long-Term Strategic Impact of Purchasing Partnerships" International Journal of Purchasing and Materials Management, vol. 30, no.4, 1994, pp.12-18
- Grant, A.W.H and L.A. Schlesinger "Realise Your Customers' Full Profit Potential" Harvard Business Review, September-October 1995
- Greenley, G.E. Forms of Market Orientation in UK Companies, Journal of Management Studies, Vol.32, No.1, January 1995, pp.1-22
- Hair, J.F. Jr, R.E. Anderson, R.L. Tatham and W.C. Black, Multivariate data analysis, 1998, Prentice Hall, New Jersey.

- Hakansson, H. J. Johanson and B. Wootz, "Influence Tactics in Buyer-Seller Processes", in F. David (ed) Understanding Business Markets, The Dryden Press, 1997, London
- Hallen, L., J. Johanson and N. Seyed-Mohamed "Interfirm Adaptation in Business Relationships" Journal of Marketing Vol. 55 (April) 1991, pp. 29-37
- Handfield R.B. "A resource dependence perspective of Just-in-Time Purchasing" Journal of Operations Management, Vol. 11, 1993, pp. 289-311
- Harland, C.M. "The dynamics of customer dissatisfaction in supply chains" Production Planning and Control, Vol. 6, No. 3, Special Issue: Supply-Chain-Management, May-June 1995
- Harland, C.M. "Focus in supply chains" Proceedings of the 2nd International Symposium on Logistics, pp. 129-134, 11-12 July 1995, University of Nottingham
- Harland, C.M. "Networks and globalisation-a review of research" EPSRC Grant No. GRK 53178, 1995
- Harland, C.M. "Supply Chain Management: Relationships, Chains and Networks" British Journal of Management Vol. 7, Special Issue, March 1996, pp. 63-80
- Harrington, T.C., D.M. Lambert and J.U. Sterling "Simulating the Financial Impact of Marketing and Logistics Decisions" International Journal of Physical Distribution & Logistics Management, Vol. 22, No. 7, 1992, pp. 3-12
- Harrison A. "The impact of schedule stability on supplier responsiveness: A comparative study" Proceedings of the 2nd International Symposium on Logistics, pp. 217-224, 11-12 July 1995, University of Nottingham
- Hart, S.J., J.R. Webb and M.V. Jones "Export Marketing Research and the Effect of Export Experience in Industrial SMEs", International Marketing Review, vol.11, no.6, 1994, pp.4-22
- Hart, N. (editor) The Marketing of Industrial Products, McGraw-Hill Ltd, 1984
- Hart, N. (editor) Effective Industrial Marketing: Business-to-Business Marketing of Goods and Services, Kogan Page 1994
- Hartley, J.L. and T.Y. Choi "Supplier Development: Customers As A Catalyst Of Process Change" Business Horizons, July-August 1996
- Harvard Business School "Fabritek Corporation", Case Study #669-004
- Harvard Business School "Blitz Company" Case Study #609-003, 1962

- Harvard Business School "Donner Company" Case Study #9-689-030, 1988
- Hayes, R. and Pisano G. "Beyond World-Class: The New Manufacturing Strategy", Harvard Business review, January-February 1994, pp. 77-86
- Hayes, R.H. and S.T. Wheelwright "Link manufacturing process and product life cycles" Harvard Business Review, January-February 1979, pp. 133-140
- Heide, J.B "Interorganisational Governance in Marketing Channels" Journal of Marketing, Vol. 58, January 1994, pp. 71-85
- Heide, J. and John G., "Alliances in Industrial Purchasing: The Determinants of Joint Action in Buyer-Supplier Relationships", Journal of Marketing Research, Vol.27, No. 2, 1990, pp. 24-36
- Hellsten, U. "The Springboard: A strategy for continuous improvement of small and medium-sized companies" Total Quality Management, vol.8, no.2-3, 1997, pp.S183-S186
- Heskett, J.L., W.E. Sasser, Jr. and C.W.L. Hart Service Breakthroughs. Changing the Rules of the Game, The Free Press, 1990
- Heskett, J.L., T.O. Jones, G.W. Loveman, W. E. Sasser, Jr. and L.A. Schlesinger "Putting the Service-Profit Chain to Work" Harvard Business Review, March-April, 1994, pp.164-174
- Helper, S. "How Much Has Really Changed Between U. S. Automakers and Their Suppliers?" Sloan Management Review, Summer 1991, pp. 15-28
- Helper, S. and M. Sako "Supplier relations in Japan and the United States: are they converging?" Sloan Management Review, Spring 1995, pp.77-84
- Hines, P. "Purchasing for lean production: the new strategic agenda" International Journal of Purchasing and Materials Management, Vol. 32, No. 1, Winter 1996, pp. 2-10
- Hines, P.,R. James and O. Jones(1995) "The supplier development matrix: a tool for awareness raising, acceptance and implementation planning" Proceedings of the 2nd International Symposium on Logistics, pp. 87-94, 11-12 July 1995, University of Nottingham
- Hill, T. Small business: Production/Operations Management, MacMillan Education Ltd, 1987
- Hill, T. Manufacturing Strategy: Text and Cases, Irwin.1989

- Holmlund, M and S. Kock "Buyer-Dominated Relationships in a Supply Chain-A Case Study of Four Small Suppliers", International Small Business Journal, October-December 1996, pp.26-40
- Homse, E. An interaction approach to marketing and purchasing strategy, PhD dissertation, University of Manchester, 1981
- Hooley, G.J. and D. Jobber "Five Common Factors in Top Performing Industrial Companies" Industrial Marketing Management, Vol. 15, No. 2, May 1986, pp.89-96
- Howard, R. "Can Small Business Help Countries Compete?" Harvard Business Review, November-December 1990, pp.88-103
- Hunt, S. and J. Nevin "Power in a Channel of Distribution: Sources and Consequences" Journal of Marketing Research, vol.11, May, 1974, pp.186-193
- Iijima, M., S. Komatsu and S. Katoh "Hybrid just-in-time logistics systems and information networks for effective management in perishable food industries", International Journal of Production Economics, Vol. 44, No. 1,2, June 1996, pp. 97-103
- IMP Project Group International Marketing and Purchasing of Industrial Goods, Hakansson H.(editor) University of Uppsala 1982
- IMP Group Understanding Business Markets: Interaction, Relationships and Networks, Ford D. (editor), Academic Press 1990
- Inger R. "Creating a manufacturing environment that is in harmony with the market-the "how" of supply chain management" Production Planning and Control, Vol. 6, No. 3, Special Issue: Supply-Chain-Management, May-June 1995
- Jackson, B.B., Winning and Keeping Industrial Customers, Lexington, Mass.:D.C. Heath, 1985
- James-Moore, S.M. and A. Gibbons "Is lean manufacture universally relevant? An investigative methodology" International Journal of Operations & Production Management, Vol. 17 Numbers 9 and 10 1997, pp. 899-911
- Jaworski, B.J. and A.K. Kohli "Market Orientation: Antecedents and Consequences" Journal of Marketing, Vol.57 No.3 July 1993, pp. 53-70
- Jenkins, M. and M.McDonald, Market Segmentation: Organisational Archetypes and Research Agendas, Working Paper, Cranfield School of Management, SWP/14/94

- Johanson, J. Production technology and user-supplier interaction, in International Marketing and Purchasing of Industrial Goods: An Interaction Approach, IMP Group, H.Hakansson (ed), John Wiley & Sons, 1982, pp. 316-323
- Johnson, H.T. and R.S. Kaplan, Relevance Lost. The Rise and Fall of Management Accounting, Harvard Business School Press, Boston, Massachusetts, 1991
- Johnston, W.J. and J.E. Lewin "Organisational Buying Behavior: Toward an Integrative Framework" Journal of Business Research Vol.35, No.1, January 1996, pp.1-16
- Jick, T.D."Mixing Qualitative and Quantitative Methods: Triangulation in Action" Administrative Science Quarterly, Vol. 24, December 1979, pp. 602-611
- Kalwani, M.U. and N. Narayandas "Long-Term Manufacturer-Supplier Relationships: Do They Pay Off for Supplier Firms?" Journal of Marketing, January 1995, pp. 1-16
- Kaplan, R.S. "Kanthal (A) and (B) Teaching Note" Harvard Business School Case Study (#5-190-115), Rev. September 28, 1994
- Kaplan, R.S. "Kanthal (A)" Harvard Business School Case Study (#9-190-002) Rev. April 24, 1995
- Kaplan, R.S. "Kanthal (B)" Harvard Business School Case Study (#9-190-003) Rev. August 25, 1993
- Kaplan, R.S. "Yesterday's accounting undermines production" Harvard Business Review, July-August 1994, pp. 95-101
- Kaplan, R.S. (editor) Measures for Manufacturing Excellence, Harvard Business School Press, Boston, Massachusetts, 1990
- Karlsson, C. and Par Ahlstrom "A lean and global smaller firm?" International Journal of Operations & Production Management, Number 10, 1997, pp. 940-952
- Karmarkar, U.S. "Integrative Research in Marketing and Operations Management" Journal of Marketing Research Vol. XXXIII, May 1996, pp. 125-133
- Karmarkar, U.S., P.J. Lederer and J. L. Zimmerman Choosing Manufacturing Production Control and Cost Accounting Systems, in Kaplan (editor) Measures for Manufacturing Excellence, Harvard Business School Press, 1990, Boston, Mass.
- Kearney A.T. *Partnership or Power Play?* 1994

- Kerlinger, F.N. Foundations of Behavioral Research Holt-Saunders International Editions, 1973
- Khurana, A. and S. R. Rosenthal "Integrating the Fuzzy Front End of New Product Development" Sloan Management Review, vol. 38, no.2, (winter) 1997, pp. 103-120
- Kim, J.S. and Arnold, P. "Operationalising Manufacturing Strategy: An exploratory Study of Constructs and Linkage" International Journal of Operations and Production Management, Vol. 16, No. 12, 1996, pp. 45-73
- Kortge, D.G. and P.A. Okonkwo, "Perceived Value Approach to Pricing" Industrial Marketing Management, Vo. 22, No.2, May 1993, pp. 133-140
- Kotler, P. Marketing management: analysis, planning, implementation and control, 1994, Prentice Hall, New Jersey
- Krapfel, R.E. Jr., D. Salmond and R. Spekman "A Strategic approach to Managing Buyer-Seller Relationships" European Journal of Marketing, vol. 25, No. 9, 1991, pp. 22-37
- Krause, D.R., and L.M. Ellram "Supplier Development: Current Practices" Proceedings for the First Worldwide Research symposium on Purchasing and Supply Chain Management, University of Arizona, 1995, pp.384-394
- Kumar, N. "The power of trust in manufacturer-retailer relationships" Harvard Business Review, November-December 1996, pp. 92-110
- Kwaku Atuahene-Gima "Market Orientation and Innovation", Journal of Business Research, vol.35, 1996, pp.93-103
- La Londe, B.J. and Masters, J.M. "Logistics Strategies for the USA" in Logistics and Distribution Planning, J. Cooper (editor), Kogan Page Ltd, London, 1994
- La Londe, B.J, M.C. Cooper and T.G. Noordewier Customer Service: A Management Perspective, Council of Logistics Management, IL, 1988
- LaPlaca, P.J. "Contributions to Marketing Theory and Practice from *Industrial Marketing Management*" Journal of Business Research, Vol.38, No.3, March 1997, pp. 179-198
- Lambert, D.M. and J.U. Sterling "What Types of Profitability Reports do Marketing Managers Receive?" Industrial Marketing Management, Vol. 16, No. 4, 1987, pp. 295-304

- Lambert, D.M. and A. Sharma "A Customer-based Competitive Analysis for Logistics Decisions" International Journal of Physical Distribution and Logistics Management, Vol. 20, No.1, 1990, pp. 17-24
- Lamming, R. Beyond Partnership: Strategies for innovation and lean supply, 1993, Prentice Hall, New York
- Lamming, R.C. "Five Years On: How is Lean Supply Doing?" Proceedings for the First Worldwide Research Symposium on Purchasing and Supply Chain Management, March 23-25, 1995, Tempe, Arizona, pp. 122-132
- Landeros, R., R.F.Reck and F.T. Griggs "Evaluating Suppliers' Overhead Allocations" International Journal of Purchasing and Materials Management, Vol.30, No.2, pp. 40-50
- Lee, H.L., V. Padmanabhan and S. Whang "The Bullwhip effect in Supply Chains" Sloan Management Review, Spring 1997, pp. 93-102
- Lee, H.L. and C. Billington "The Evolution of Supply Chain Management Models and Practice at Hewlett-Packard" Interfaces Vol. 25, No. 5, 1995, pp. 42-63
- Lee, L.G. and I. Oakes, "The "Pros" & "Cons" of TQM for Smaller Firms in Manufacturing: Some Experiences Down the Supply Chain" Working Paper, RP9508, Aston Business School, Research Institute, 1995
- Leenders, M.R. and D.L. Blenkhorn Reverse Marketing: the new buyer-supplier relationship. The Free Press 1988
- Lefebvre, L. "Competitive positioning and innovative efforts in SMEs" Small Business Economics, vol.5, no.4, 1993, pp.297-305
- Leuthesser, L. and A.K. Kohli " Relational Behaviour in Business Markets. Implications for Relationship Management" Journal of Business Research, vol. 34, 1995, pp.221-233
- Leuthesser, L. "Supplier Relational Behaviour: An Empirical Assessment" Industrial Marketing Management, vol. 26, 1997, pp.245-254
- Leverick, F. and R. Cooper "Partnerships in the Motor Industry: Opportunities and Risks for Suppliers" Long Range Planning, Vol.31, Issue 1, February 1998, pp.72-81
- Levitt, T.(a), Marketing Myopia in Strategic Marketing Management, Dolan R.J. (Editor), Harvard Business School Publications, 1991, Boston, Massachusetts, pp. 21-44

- Levitt, T.(b) Marketing Success Through Differentiation-of Anything in Strategic Marketing Management, Dolan R.J. (Editor), Harvard Business School Publications, 1991, Boston, Massachusetts, pp. 194-207
- Levitt, T. (c) After the Sales Is Over... in Strategic Marketing Management, Dolan R.J. (Editor), Harvard Business School Publications, 1991, Boston, Massachusetts, pp. 417-428
- Levy, D.L. "Lean Production in an International Supply Chain" Sloan Management Review, Winter 1997, pp. 94-102
- Lewis, J.C., M.M. Naim and D.R. Towill "Re-engineering the supply chain interface-an integrated approach" Proceedings of the 2nd International Symposium on Logistics, pp. 329-335, 11-12 July 1995, University of Nottingham
- Li, S.X., Z. Huang and A. Ashley "Improving buyer-seller system co-operation through inventory control" International Journal of Production Economics, Vol. 43, No. 1, May 1996, pp. 37-46
- Lichtenthal, J.D., D.T. Wilson and M.M. Long "Scientific Contributions to the Field from the *Journal of Business-to-Business Marketing*" Journal of Business Research, Vol.38, No.3, March 1997, pp. 211-234
- Lieberman, M.B., S. Helper and L. Demeester "The empirical determinants of inventory levels in High-volume manufacturing" Production and Operations Management, vol. 8, no.1, Spring 1999, pp.44 -55
- Lusch, R.F. and J. R. Brown "A Modified Model of Power in the Marketing Channel" Journal of Marketing Research, vol. XIX, August 1982, pp.312-323
- Lusch, R.F. "Sources of Power: Their Impact on Intrachannel Conflict" Journal of Marketing Research, Vol. XIII November 1976, 382-390
- Lyons B.R. and S. Bailey "Small Subcontractors in UK Engineering: Competitiveness, Dependence and Problems" Small Business Economics, vol. 5, 1993, pp.101-109
- Macbeth, D. and N. Ferguson, Partnership Sourcing: An Integrated Supply Chain Approach, 1994, Pitman, London
- Madsen, T.K. "Successful Export Marketing Management: Some Empirical Evidence" International Marketing Review, vol.6, no.4, 1989, pp.41-57

- Management Accounting, "It's time to change the payment culture", Management Accounting, vol.76, no.11, 1998, p.28
- Manchester Manufacturing Management Center "Manufacturing Practices in New Hampshire, Survey 1993-1994" Whittemore School of Business and Economics, University of New Hampshire, 1994, US.
- Manu, F.A and V. Sriram, "Innovation, Marketing Strategy, Environment, and Performance" Journal of Business Research, vol.35, 1996, pp.79-91
- Mapes, J., C. New and M. Szwejcowski "Performance trade-offs in manufacturing plants" International Journal of Operations & Production Management, Vol. 17, No. 10, 1997, pp. 1020-1033
- Mathe, H. and R.D. Shapiro Integrating Service Strategy in the Manufacturing Company, 1993, Chapman & Hall.
- McCullen, P. and S. Champion "The influence of structure on supply chain relationships: Building structures to facilitate win-win behaviour" Proceedings of the 2nd International Symposium on Logistics, pp. 111-120, 11-12 July 1995, University of Nottingham
- McCutcheon, D., I. F. Stuart and W. Farwell "Measuring Trust to Develop Better Supplier Alliance Relationships" Proceedings of the 9th Annual Meeting of POMS, 1998
- McQuarrie, E.F. and S.H. McIntyre "The Customer Visit: An Emerging Practice in Business-to-Business Marketing" Working Paper, Marketing Science Institute, Report Number 92-114, May 1992
- Miles R.E. and C.C. Snow "Causes of Failure in Network Organisations" California Management Review Vol. 34, No. 4 1992, pp. 53-72
- Miesenbock, K.J. "Small Businesses and Exporting: A Literature Review", International Small Business Journal, vol.6, no.2, January-March, 1988, pp.42-61
- Monczka, R.M., R. Trent and T.J. Callahan "Supply Base Strategies to Maximise Supplier Performance" International Journal of Physical Distribution and Logistics Management , Vol. 23, No. 4 1993, pp. 42-54
- Monczka, R.M., T.J. Callahan and E.L. Nichols "Predictors of relationships among buying and supplying firms" International Journal of Physical Distribution and Logistics Management, Vol. 25, No. 10, 1995, pp.45-59

- Moriarty, R.T. and U. Moran Managing Hybrid Marketing Systems in Strategic Marketing Management, Dolan R.J. (Editor), pp. 357-374, Harvard Business School Publications, 1991, Boston, Massachusetts
- Morrow, M. (editor) Activity-based management. New approaches to Measuring Performance and Managing Costs. Woodhead-Faulkner 1992
- Myer, R. "Suppliers-Manage Your Customers" Harvard Business Review, Vol. 67, No.6, November-December 1989, pp. 160-168
- Naim M.M. and D.R. Towill "What's in the pipeline?" Proceedings of the 2nd International Symposium on Logistics, pp. 135-142, 11-12 July 1995, University of Nottingham
- Narver, J.C. and Slater, S.F. The Effect of Market Orientation on Business Profitability, Journal of Marketing, Vol. 54, No.4, October 1990, pp. 20-35
- Nassimbeni, G. "Factors underlying operational JIT purchasing practices: results of an empirical research", International Journal of Production Economics, Vol. 42, No.3, April 1996, pp. 275-288
- Neuman, W.L., Social Research Methods, Allyn and Bacon, Massachusetts, 1991
- New, S.J. "A framework for analysing supply chain improvement" International Journal of Operations and Production Management, Vol. 16, No. 4, 1996 pp. 19-34
- New, S.J. and P. Payne "Research frameworks in logistics" International Journal of Physical Distribution & Logistics Management, Vol. 25, No. 10, 1995, pp. 60-77
- New, S.J. and I. Mitropoulos "Strategic networks: morphology, epistemology and praxis" International Journal of Operations and Production Management, Vol. 15 No.11, 1995, pp. 53-61
- New, S and B. Burnes "Supply Chain Integration: Results from a Mixed-Method Pilot Study" Manufacturing and Production Procurement, IPSERA 4th International Annual Conference, University of Birmingham, 11-12 April 1995.
- Nielson, C.C. "An empirical examination of the role of "closeness" in industrial buyer-seller relationships" European Journal of Marketing, vol.32, no. 5/6, 1998, pp.441-463
- Noordewier, T.G., G. John and J.R. Nevin "Performance Outcomes of Purchasing Arrangements in Industrial Buyer-Vendor Relationships" Journal of Marketing, October 1990, pp. 80-93

- Norman, M. and B. Stoker Data Envelopment Analysis. The Assessment of Performance, 1991, John Wiley & Sons
- Normann, R. and R. Ramirez "From Value Chain to Value Constellation: Designing Interactive Strategy", Harvard Business Review, July-August 1993
- Nunnally, J. Psychometric Theory, McGraw Hill, New York, 1978
- Oakes, I.K. and G.L. Lee "Approaches to innovation amongst component suppliers: some smaller firm perspectives" International Journal of Technology Management, Special Issue on Resources for SME Innovation, Vol. 12, Nos. 7/8, 1996, pp.808-819
- O' Brien, P. and P. Walley "How HRC quietly professionalized" Small Business and Enterprise Development, Vol. 2, 1995, pp. 31-39
- Oliver, N. "JIT: Issues and Items for The Research Agenda" International Journal of Physical Distribution & Logistics Management, Vol. 20, No. 7, 1990, pp. 3-11
- Olsen, R. F. and L.M. Ellram "A Portfolio Approach to Supplier Relationships" Industrial Marketing Management, Vol. 26, 1997, pp. 101-113
- Paterson, W. "Public Relations" in N. Hart (editor) The Marketing of Industrial Products , McGraw-Hill, Maidenhead, 1984, pp.72-80
- Pelham, A.M. and D.T. Wilson "Does Market Orientation Matter for Small Firms?" Working Paper, Marketing Science Institute, Report No. 95-102, April 1995
- Perry, M., A.S. Sohal and B. Crawford "Developing effective supplier-customer relationships" Proceedings of the 2nd International Symposium on Logistics, pp. 103-109, 11-12 July 1995, University of Nottingham
- Pesch, M.J. and R.G.Schroeder, "Measuring Factory Focus: An Empirical Study", Production and Operations Management, vol.5, no.3, (Fall 1996), pp.234-254
- Pettitt, S.J. "Small Firms and their Major Customers: An Interaction and Relationship Approach" PhD Dissertation, Cranfield School of Management, September 1992
- Pine II, B.J., B. Victor and A.C. Boynton "Making Mass Customization Work" Harvard Business Review, September-October 1993, pp. 108-121
- Plank, R.E. "Theory, Practice, and Empirical Development Contributions: *Advances in Business Marketing and Purchasing*" Journal of Business Research, Vol.38, No.3, March 1997, pp. 235-242
- Porter, M. Competitive advantage. Creating and sustaining superior performance. The Free Press, 1985

- Quinn, J.B., T.L. Doorley, and P.C. Paquette "Beyond Products: Services-Based Strategy, Harvard Business Review, March-April 1990, pp.58-68
- Reichheld, F.F. "Loyalty-based management" Harvard Business Review, March-April 1993, pp. 64-74
- Reid, R.D. and N.R. Sanders "Competitive priorities and the manufacturer-supplier relationship : survey results" Working Paper, Whittemore School of Business and Economics, University of New Hampshire, January, 1998
- Reve, T. and L.W. Stern "The relationship between interorganisational form, transaction climate, and economic performance in interfirm dyads", Working Paper, Northwestern University, Kellogg Graduate School of Management, 1984
- Rhea, M.J. and D.L. Shrock "Measuring the Effectiveness of Physical Distribution Customer Service Program" Journal of Business Logistics, Vol. 8, No. 1, 1987, pp. 31-45
- Ring, P.S. and A. Van de Ven "Developmental Processes of Cooperative Interorganisational Relationships" Academy of Management Review, Vol. 19, No. 1, 1994, pp. 90-118
- Rishel, D.T. and O.M. Burns "The Impact of Technology on Small Manufacturing Firms" Journal of Small Business Management, Vol. 35, No.1, January 1997, pp. 2-11
- Roper, S. "Product innovation and small business growth: A comparison of the strategies of German, UK, and Irish companies" Small Business Economics, vol.9, no.6, 1997, pp.523-537
- Ross, E. Making Money with Proactive Pricing in Strategic Marketing Management, Dolan R.J. (Editor), pp. 21-44, Harvard Business School Publications, 1991, Boston, Massachusetts
- Safizadeh, M.H, L.P. Ritzman, D. Sharma, and C. Wood "An Empirical Analysis of the Product-Process Matrix" Management Science, vol.42, no.11, November 1996, pp.1576-1591
- Sako, M., R. Lamming and S.R. Helper "Supplier relations in the UK car industry: good news-bad news" European Journal of Purchasing and Supply Management, Vol. 1, No. 4, 1994, pp. 237-248

- Santa-Clara, J. "Logistics Simulation in Multi Supplier Operations" Human Systems Management, Vol. 12, No. 1, 1993, pp. 41-48
- Schrunder, C.L. and R. Mudambi "Progress towards Buyer-Supplier Partnerships - Evidence from Small and Medium Manufacturing Firms", Manufacturing and Production Procurement, Proceedings of the IPSERA 4th International Annual Conference, University of Birmingham, 11-12 April 1995.
- Souder, W.E. and X.M. Song "Contingent Product Design and Marketing Strategies Influencing New Product Success and Failure in US and Japanese Electronics Firms", Journal of Product Innovation Management, Vol.14,no.1, (January) 1997, pp.21-34
- Schonberger, R. "Strategic Collaboration: Breaching the Castle Walls", Business Horizons, March-April 1996
- Seldon, C. W. J "Logistics, the enabling strategy of the lean enterprise" Proceedings of the 2nd International Symposium on Logistics, pp. 9-14, 11-12 July 1995, University of Nottingham
- Shapiro, B.P. "What the Hell Is 'Market Oriented'" Harvard Business Review, vol.66, no.6, 1988, pp.119-125
- Shapiro, B.P. "Can marketing and manufacturing coexist?" Harvard Business Review, vol.55, no.5, 1977, 104-114
- Shapiro, B.P., V.K. Rangan, R.T. Moriarty, and E.B.Boss "Manage customers for profits(not just sales)" Harvard Business Review, Vol. 65, No. 5, September-October 1987, pp. 101-108
- Shapiro, B.P. and J.Wyman 'New Ways to Reach Your Customers' in Strategic Marketing Management, Dolan R.J. (Editor), pp. 388-402, Harvard Business School Publications, 1991, Boston, Massachusetts
- Shapiro, B.P. 'Close Encounters of the Four Kinds: Managing Customers in a Rapidly Changing Environment' in Strategic Marketing Management, Dolan R.J. (Editor), pp. 429-456, Harvard Business School Publications, 1991, Boston, Massachusetts
- Shapiro, B.P. "Specialties vs. Commodities: The Battle for Profit Margins" Harvard Business School, No. 9-587-120
- Sharma, A. and J. N. Sheth "Relationship Marketing: An Agenda for Inquiry" Industrial Marketing Management, Vol. 26, No.2, 1997, pp. 87-90

- Sheth, J.N. and A. Sharma "Supplier Relationships. Emerging issues and Challenges" Industrial Marketing Management, Vol. 26, 1997, pp. 91-100
- Sharma, U. and D.M. Lambert "Segmentation of Markets Based on Customer Service" International Journal of Physical Distribution and Logistics Management, Vol. 20, No. 7, 1990, pp. 19-27
- Shycon, H.N. and C.R. Sprague "Put a price tag on your customer servicing levels" Harvard Business Review, July-August 1975, pp.71-78
- Siguaw, J.A., P.M. Simpson, and T.L. Baker "The Influence of Market Orientation on Channel Relationships: A Dyadic Examination", Working Paper, Marketing Science Institute, Report No.97-103, May 1997
- Siguaw, J. and E. Honeycutt "Flexible manufacturing and the organisation's marketing practices" Journal of Strategic Marketing, Vol.1, No. 4, December 1993, pp.231-246
- Skinner, W. "The focused factory" Harvard Business Review, May-June 1974, pp. 113-121
- Skinner, W. "Manufacturing-missing link in corporate strategy" Harvard Business Review, May-June 1969, pp. 136-145
- Small Business Research Centre, The State of British Enterprise. Growth, Innovation and Competitive Advantage in Small and Medium sized Firms Small Business Research Centre, University of Cambridge, 1992
- Smallbone, D., D. North and R. Leigh, Managing change for growth and survival: a study of mature manufacturing firms in London during the 1980s" ESRC Small Business Research Initiative, Middlesex Polytechnic Working Paper no.3, 1992
- Smith, K.G. S.J. Carroll and S.J. Ashford "Intra- and Interorganisational Cooperation: Toward a Research Agenda" The Academy of Management Journal, Vol. 38, No. 1, February 1995, pp. 7-23
- Song, M.X. and Xie, J. The Effect of R&D-Manufacturing-Marketing Integration on New Product Performance in Japanese and U.S. Firms: A Contingency Perspective, Working Paper, Report No. 96-117, Marketing Science Institute, November 1996
- Souder W.E. and X.M. Song "Contingent Product Design and Marketing Strategies Influencing New Product Development success and Failure in US and Japanese

- Electronic Firms” Journal of Product Innovation Management, vol.14, no.1, January 1997, pp.21-34
- Spekman, R.E. and D. Salmond “A working consensus to collaborate: a field study of manufacturer-supplier dyads” Working paper , report number 92-134, Marketing Science Institute, 1992
- Spencer, M. and J.F. Cox III “Sales and manufacturing coordination in repetitive manufacturing: Characteristics and problems” International Journal of Production Economics, Vol. 37, 1994, pp. 73-81
- Sprague, L.G., B. Munoz-Seca and J. Riverola “A diagnostic tool for the Small-to Medium-sized Manufacturer: Strategy Development through Analysis of Current Operations” Proceedings of the Fourth International Meeting of the Decision Sciences Institute, Sydney, Australia (1997)
- Stalk, G. and T. Hout Competing against time. How Time-based Competition Is Reshaping Global Markets, the Free Press 1990
- Stalk, G. and A.M. Webber “Japan’s Dark Side of Time” Harvard Business Review, July-August 1993.
- Sterling, J.U. and D.M. Lambert “Establishing Customer Service Strategies Within the Marketing Mix” Journal of Business Logistics, Vol. 8, No. 1, 1987, pp. 1-30
- Stern, L.W. and F.D. Sturdivant, “Customer-driven Distribution Systems” in Strategic Marketing Management, Dolan R.J. (Editor), pp. 337-347, Harvard Business School Publications, 1991, Boston, Massachusetts
- Stiles, J. “A Framework For Analysing Cooperative/Competitive Perspectives In Strategic Partnerships” Working Paper HWP 9516, Henley Management College, 1995
- Storey, D. and P. Morgan, The Ten Percenters. Third Report, Fast Growing SMEs in Great Britain, Deloitte & Touche, 1998
- Storey, D., R. Watson and P.Wynarczyk “Fast Growth Small Business. Case Studies of 40 Small Firms in North East England”, Research Paper No. 67, Department of Employment, 1989
- Storey, D.J. Understanding the Small Business Sector, Routledge, 1994

- Stuart, I. "Supplier partnerships: Influencing factors and strategic benefits" International Journal of Purchasing and Material Management, vol.29, no.4, 1993, pp.22-28
- Stuart, F. I., D. M. McCutcheon and R.A. Grant "Strategic Supplier Alliances and Information Exchanges: Process and Content" Proceedings of the First Worldwide Research Symposium on Purchasing and Supply Chain Management, March 23-25, 1995, Tempe, Arizona, pp. 227-238
- Stuart, F.I. "Supplier alliance success and failure: a longitudinal dyadic perspective" International Journal of Operations and Production Management, Vol. 17, Nos. 5 and 6, 1997, pp. 539-557
- Stuart, F.I and D. McCutcheon "Sustaining strategic supplier alliances: profiling the dynamic requirements for continued development" International Journal of Operations and Production Management, vol.16, no.10, 1996, pp.5-22
- Stump, R.L. and V. Sriram 'Employing Information Technology in Purchasing: Buyer-Supplier Relationships and Size of the Supplier Base' Industrial Marketing Management, Vol. 26, 1997, pp. 127-136
- Styles C. and T. Ambler "Successful Export Practice: the UK experience" International Marketing Review, vol.11, no.6, 1994
- Sweeney, T.M. and M. Szejczewski "Manufacturing strategy and Performance: A Study of the UK Engineering Industry", Working Paper, Cranfield School of Management, SWP 18/95, 1995
- Szeinbach, S.L., J.H. Barnes, and D.D. Garner "Use of Pharmaceutical Manufacturers' Value-Added Services to Build Customer Loyalty", Journal of Business Research, Vol. 40, 1997, pp.229-236
- Szymankiewicz, J. "Supply-Chain Partnerships, Who Wins?" Logistics Focus, vol.2, no.10, 1994, pp.8-11
- Tabachnick G.B. and L.S. Fizzell Using multivariate statistics, 1989, Harper Collins Publishers, New York
- Taylor, D(editor). Global Cases in Logistics and Supply Chain Management, International Thomson Business Press 1997

The Sunday Times, Price Waterhouse Coopers, Mercury Asset Management, "Fast Track 100: Britain's 100 fastest-growing companies", The Sunday Times, 6 December 1998

Terazono, E. "Late Payments: Small companies may now have the option to charge interest on debts, but few are likely to do so", Financial Times, 19 March 1999

De Toni A. and G. Nassimbeni "Supply Networks: Genesis, Stability and Logistics Implications. A Comparative Analysis of Two Districts" Omega International Journal of Management Science, Vol. 23, No. 4, 1995, pp. 403-418

De Toni, A. and G. Nassimbeni "Strategic and operational choices for small subcontracting firms. Empirical results and an interpretative model" International Journal of Operations and Production Management, Vol. 16 No. 6, 1996, pp. 41-55

Treacy, M. and F. Wiersema Customer Intimacy and Other Value Disciplines, Harvard Business Review, January-February 1993, pp. 84-96

Turnbull, P. "A Review of Portfolio Planning Models for Industrial Marketing and Purchasing Management", European Journal of Marketing, Vol. 24, No. 3, 1990, pp. 7-22

Turnbull, P., N. Oliver and B. Wilkinson "Buyer-supplier Relations in the UK Automotive Industry: Strategic Implications of the Japanese Manufacturing Model" Strategic Management Journal, Vol. 13, No.2 1992, pp. 159-168

Turnbull, P., R. Delbridge, N. Oliver and B. Wilkinson "Winners and Losers-the 'Tiering' of Component Suppliers in the UK Automotive Industry", Journal of General Management, Vol. 19 No.1 1993, pp. 48-63

Turnbull, P.W. and Cunningham, M.T. International Marketing and Purchasing: A Survey of Attitudes of Marketing and Purchasing Executives in five European Countries. 1981, Macmillan, London.

Turok, I. "Which small firms grow?" in Davies, L.G and A.A. Gibb (editors) Recent Research in Entrepreneurship, 1991, Avebury Gower Publishing Company Limited, Aldershot

Vandijk, B. "Some new evidence on the determinants of large and small firm innovation", Small Business Economics, vol.9, no.4, 1997, pp.335-343

Vavra, T.G. Aftermarketing: How to Keep Customers for Life Through Relationship Marketing, Irwin, New York, 1992

- Verma, R. and J.C. Goodale "Statistical power in operations management research" Journal of Operations Management, vol.13, no.2, 1995, pp.139-152
- Vollmann, T.E. Operations Management, Addison-Wesley Publishing Company, 1973
- Vollmann T.E., W.L. Berry and D.C. Whybark Manufacturing Planning and Control Systems, Irwin 1997
- Vonortas, N.S. and L. Xue, "Process innovation in small firms: case studies on CNC machine tools" Technovation, vol.17, no.8, 1997, pp.427-438
- Voss, C., K. L. Blackmon, R. Cagliano, P. Hanson and F. Wilson "Made in Europe: Small Companies" Business Strategy Review, vol. 9, issue 4, 1998, pp.1-19
- Voss, C. "Applying Service Concepts in Manufacturing", International Journal of Operations and Production Management, vol. 12, no.4, 1992, pp.93-99
- Wacker, J.G. and L.G. Sprague, "The impact of institutional factors on forecast accuracy: manufacturing executives perspective", International Journal of Production Research, vol. 33, no. 11, 1995, pp.2945-2958
- Wacker, J.G. and L.G. Sprague, "Forecasting accuracy: comparing the relative effectiveness of practices between seven developed countries" Journal of Operations Management, Vol.16, 1998, pp.271-290
- Wang, E. T. and A. Seidmann, "Electronic Data Interchange: Competitive Externalities and Strategic Implementation Policies", Management Science, vol.4 march, 1995, pp.401-418
- Waters-Fuller, N. "The win-win relationship? A case for a just in time supplier" Proceedings of the 2nd International Symposium on Logistics, pp. 209-216, 11-12 July 1995, University of Nottingham
- Waters-Fuller, N. "The benefits and costs of JIT sourcing: a study of Scottish suppliers" International Journal of Physical Distribution and Logistics Management, Vol. 26, No. 4, 1996, pp. 35-50
- Weber, M. "A framework for analysing sources of variance in the buyer-supplier relationship" Journal of Marketing Theory and Practice Vol. 4 No. 2, Spring 1996, pp. 61-71
- Webster, F.E. Market-driven management. Using the new marketing concept to create a customer-oriented company, 1994, Wiley, New York

- Webster, M., A. Muhlemann, and C. Alder "Subcontract manufacture in the electronics assembly industry-cases of industrial practice", Proceedings of the 5th International Conference of the European Operations Management Association, Dublin, Ireland, June 14-17, 1998, pp. 562-567
- Van Weele, A.J., "Partnership Revisited: the New Reality of Performance Based Purchasing" Proceedings for the First Worldwide Research Symposium on Purchasing and Supply Chain Management, March 23-25, 1995, Tempe, Arizona, pp. 39-48
- Wilson, L.O., A.M. Weiss and G. John "Unbundling of Industrial Systems", Journal of Marketing Research, May 1990, pp. 123-138
- Womack, J., D. Jones and D. Roos The Machine That Changed The World, Macmillan 1990.
- Woodruff, R.B., and S. Fisher Gardial, Know Your Customer: new Approaches to Understanding Customer Value and Satisfaction, Blackwell Publishers, Cambridge, Mass., 1996
- Wheelwright, S.C. and K.B. Clark "Revolutionilizing Product Development", The Free Press, New York, 1992
- Whybark, D.C. and Vastag, G (Eds) Global manufacturing practices: A worldwide survey of practices in production planning and control, Amsterdam, Elsevier, 1993
- Wijewardena, H. and G.E. Tibbits, "Factors Contributing to the Growth of Small Manufacturing Firms: Data from Australia" Journal of Small Business Management, vol.37, no.2, April, 1999, pp.88-95
- Wilton, J.T. and L.R.P. Reavill "The small or medium-sized enterprise, its multinational client(s) and process-oriented change: A systems approach with case study", Total Quality Management, vol.8, no.2-3, 1997, pp.S314-S318
- Wood, C.H, A. Kaufman and M. Merenda "How HADCO became a problem-solving supplier" Sloan Management Review, vol.37, no.2, 1996, pp.77-88
- Yap, C.M. and W.E. Souder "Factors Influencing New Product Success and Failure in Small Entrepreneurial High-Technology Electronics Firms" The Journal of Product Innovation Management, vol.11, no.5, November 1994, pp.418-432
- Yoke, D.A. "An Interaction Approach to the Management of a Portfolio of Customer Opportunities" Market Intelligence & Planning, Vol. 2, No. 3, 1984, pp. 5-22

Zinn, W. and A. Parasuraman "Scope and Intensity of Logistics-Based Strategic Alliances. A Conceptual Classification and Managerial Implications" Industrial Marketing Management, Vol. 26, 1997, pp. 137-147

APPENDIX A
THE SURVEY QUESTIONNAIRE

[illegible]

F.A.O.: Mr Vassilis Valsamakis
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Building 42a
Cranfield University
Cranfield
Bedfordshire MK43 0AL

SUPPLY CHAIN '98 SURVEY

Survey Objective

The objective of this survey is to find out how Small- to Medium-sized Manufacturers can increase their growth potential and develop better working relationships with their customers.

In this survey we have used the word “company” to represent the unit for which you are answering questions. If your unit is a subsidiary please report employment, practices etc. for this unit.

If you have any queries while completing the questionnaire please contact:
Mr. Vassilis Valsamakis, Senior Research Officer
Tel no: 01234 750111 ext.2813
Fax no: 01234 752460

Typical delivery batch size

Typical promised lead time to customers

- | | | | |
|-------------------------------|--------------------------|----------------------|--------------------------|
| one unit at a time | <input type="checkbox"/> | up to 7 days | <input type="checkbox"/> |
| up to 20 units at a time | <input type="checkbox"/> | 8-15 days | <input type="checkbox"/> |
| 21 to 100 units at a time | <input type="checkbox"/> | 16-30 days | <input type="checkbox"/> |
| more than 100 units at a time | <input type="checkbox"/> | more than 30 days | <input type="checkbox"/> |
| no typical size | <input type="checkbox"/> | no typical lead time | <input type="checkbox"/> |

31. What percentage of the machines in your company are grouped as follows?

- _____ % of machines grouped by machine type (e.g. all lathes together)
- _____ % of machines grouped for products or customers (e.g. cells)

32. Which of the following categories comes closest to characterising your processes? (you can tick more than one)

- Job shop ☐ Batch shop ☐ Production line ☐ Continuous process ☐

Thank you for taking the time to complete the questionnaire.
We would especially welcome your comments: you can use the blank space at the back. You can send us the questionnaire by mail (return envelope provided)
or you can fax it to us (fax no.: 01234 752460).
If you wish to receive a summary report with survey results, please tick here ☐
and include your business card or provide a contact address.

27. On average, how many days elapse between invoicing your customers and receiving payment from them? _____ days

28. How often are delivery policies determined by each of the following?

	never						very often
The customer	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
The company	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
Through negotiation	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>

29. How often do customers' schedule changes occur after the start of production?

	never				always
customer schedule changes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> N/A

30. What is the size of the following for your company (tick only one box for each):

<i>Typical customer order size</i>	<i>Typical production batch size</i>
one unit at a time <input type="checkbox"/>	one unit at a time <input type="checkbox"/>
up to 20 units at a time <input type="checkbox"/>	up to 20 units at a time <input type="checkbox"/>
21 to 100 units at a time <input type="checkbox"/>	21 to 100 units at a time <input type="checkbox"/>
more than 100 units at a time <input type="checkbox"/>	more than 100 units at a time <input type="checkbox"/>
no typical size <input type="checkbox"/>	no typical size <input type="checkbox"/>

A. Business Profile

1. Year established: _____

2a. Company type:

Entity	Private Limited	Public Limited	Independent	Subsidiary
Entity 1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 6	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 7	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 8	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 9	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 10	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 11	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 12	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 13	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 14	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 15	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 16	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 17	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 18	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 19	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 20	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 21	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 22	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 23	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 24	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 25	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 26	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 27	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 28	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 29	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 30	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 31	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 32	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 33	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 34	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 35	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 36	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 37	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 38	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 39	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 40	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 41	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 42	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 43	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 44	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 45	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 46	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 47	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 48	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 49	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 50	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 51	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 52	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 53	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 54	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 55	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 56	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 57	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 58	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 59	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 60	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 61	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 62	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 63	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 64	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 65	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 66	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 67	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 68	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 69	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 70	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entity 71	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. How many employees work for your company? _____ employees

4. How many employees worked for the company 3 years ago?

5. Please indicate the % of change in your sales in the last 3 years

6. How many product lines does your company have?

Up to 5 ☐ 6 to 10 ☐ 11 to 100 ☐ more than 100 ☐

7. How often do major changes occur in your major product line(s)?

	Less than a year	Annually	Up to 3 years
Less than a year	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
More than 3 years	<input type="checkbox"/>	N/A	<input type="checkbox"/>

8. Where are your major customers located (locations to which your company ships products)? (you can tick more than one)

Regionally ☐ Nationally ☐ European Union ☐
Beyond European Union ☐

B. Nature of Competition

9. What percentage of your last year's sales was _____% of sales export sales? (incl. European Union)

10. Considering your whole product/service package, (e.g. *product line breadth, the size of orders that you specialise*) how many competitors do you have?

Up to 3 ☐ 4 to 10 ☐ 11 to 20 ☐ 21 to 100 ☐ more than 100 ☐

11. In comparison with its competitors, what is your company's performance on average in each of the following?

	Far lower	About the same	Far higher	N/A
Product quality perceived by customer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
On-time deliveries	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lead time to customer (from enquiry to delivery)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ability to meet specific customer requirements	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Breadth of product range	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	N/A
Product design time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	N/A
Cost and time of servicing the product	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	N/A
Prices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

D. The Nature of Relationships with Customers

23. What percentage of last year's sales did your _____% of sales 2 largest customers account for?

24. How many customers did your company have last year?

Up to 3 ☐ 4 to 10 ☐ 11 to 30 ☐ 31 to 100 ☐ more than 100 ☐

25. What percentage of your company's personnel time working with your major customers is spent on: control tasks (*negotiating prices and specifications, monitoring performance, resolving very urgent problems and disagreements*) _____%

co-ordination tasks (*co-ordinating for improvements, exchanging ideas and future plans, keeping in touch with customers*) _____% (These two should total 100%)

26. Approximately what percentage of your last year's sales was covered by: Long-term contracts (annual or more) _____% of sales Purchase orders for a few months _____% of sales Individual orders _____% of sales (These should total 100%)

21. To what extent do you use the following means for getting new business?

	Not at all	To a great extent
Direct mail, phone calls	<input type="checkbox"/>	<input type="checkbox"/>
Trade shows, advertisements in trade journals	<input type="checkbox"/>	<input type="checkbox"/>
Salespeople calls	<input type="checkbox"/>	<input type="checkbox"/>
Top management	<input type="checkbox"/>	<input type="checkbox"/>
Use of the Internet	<input type="checkbox"/>	<input type="checkbox"/>
Word of mouth	<input type="checkbox"/>	<input type="checkbox"/>

12. Compared with your company, what is the average employment size of:

	Much smaller	About the same	Much bigger
Your major competitors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Your major customers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C. Managing Relationships with Customers

13. Please indicate what percentage of your company's products are:

tailor-made to a customer's specific request	_____ %
produced to a customer's order from a catalogue or a standard product listing	_____ %
made for finished goods stock without a specific customer order	_____ %
(These should total 100%)	

22. To what extent does your company use the following when trying to get the business of a customer?

	Not at all	To a great extent
--	------------	-------------------

Quantify the impact from the use of your product on customer's performance

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------	--------------------------	--------------------------

Suggest how cost savings can be made over the years

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------	--------------------------	--------------------------

Provide information about future technological developments for this product

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------	--------------------------	--------------------------

14. Have you developed any subassemblies or combined products and/or processes to perform functions previously performed by the customer or other suppliers?

Yes <input type="checkbox"/>	No <input type="checkbox"/>
------------------------------	-----------------------------

If yes, what % of sales did these represent last year?

Less than 10%	<input type="checkbox"/>
Between 11% and 25%	<input type="checkbox"/>
Between 26% and 50%	<input type="checkbox"/>
Between 51% and 75%	<input type="checkbox"/>
More than 75%	<input type="checkbox"/>

15. To what extent does your company undertake the following activities with customers?

	Not at all				To a great extent
Assistance in applications development	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Formal product design and development	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Influence product design (if not formally undertaken)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Education/training in product use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Consulting in areas that your company has expertise (e.g. mfrg processes)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

16. Do you notify customers about changes in your processes, raw materials used etc. ?

Not at all ☐ It varies ☐ Those customers whose orders may be affected at the time ☐ All our major customers ☐

All our customers ☐

17. To what extent do the following people from your company have knowledge of customers' processes and how customers use your products?

	Not at all				To a great extent
Managers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Shop floor employees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

18. To what extent do you get feedback from customers on:

	Not at all				To a great extent
Product design, performance, desired features	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Quality performance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Delivery performance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cost	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

19. To what extent is there direct communication between your shop floor employees and customers in each of the following:

	Not at all				To a great extent
Order placing and execution	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Discussing product/process features	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

20. To what extent do you have computer links with your major customers for:

	Not at all				To a great extent
Order processing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Product design	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Production scheduling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

APPENDIX B
LIST OF VARIABLES INCLUDED IN THE ANALYSIS

Appendix B. List of variables included in the analysis

The variables included in the analysis are summarised below.

Variable name	Variable description	Question no.
C_LINK1	Computer links with major customers for order processing	20
C_LINK2	Computer links with major customers for product design	20
C_LINK3	Computer links with major customers for production scheduling	20
C_ORDER	Binary variable for existence of a typical customer order size	30
CO_PERF1	Product quality perceived by the customer relative to competition	11
CO_PERF2	On-time deliveries relative to competition	11
CO_PERF3	Lead time to customer (from enquiry to delivery) relative to competition	11
CO_PERF4	Ability to meet specific customer requirements relative to competition	11
CO_PERF5	Breadth of product range relative to competition	11
CO_PERF6	Product design time relative to competition	11
CO_PERF7	Cost and time of servicing the product relative to competition	11
CO_PERF8	Prices relative to competition	11
CONTRCT1	% of last year's sales covered by long-term (annual or more) contracts	26
CONTRCT2	% of last year's sales covered by purchase orders for a few months	26
CONTRCT3	% of last year's sales covered by individual orders	26
COMP_NO	Number of competitors	10
CU_KNOW1	Managers' knowledge of customers' processes and use of products	17
CU_KNOW2	Shop floor employees' knowledge of customers' processes and use of products	17
CU_LOC	Location of major customers	8
CU_ORDER	Typical customer order size	30
CUST_NO	No. of customers	24

Variable name	Variable description	Question no.
DE_BATCH	Typical delivery batch size	30
DE_PLCY3	Determination of delivery policies through negotiation	28
DEPNDNCE	Dependence, as a % of sales, on the two largest customers	23
DR_COMM1	Direct communication between shop floor employees and customers in order placing and execution	19
DR_COMM2	Direct communication between shop floor employees and customers in discussing product/process features	19
EMP_NO	Number of employees	3
EXPORT	Export sales as % of total sales	9
FEEDBCK1	Feedback from customers on product design, performance, desired features	18
FEEDBCK2	Feedback from customers on quality performance	18
FEEDBCK3	Feedback from customers on delivery performance	18
FEEDBCK4	Feedback from customers on cost	18
GROWTH	% of change in the number of employees (3 years)	4
INVENTORY	Ratio of typical production batch size and typical delivery batch size	30
INVOICE	Delivery to payment cycle (days)	27
MC_GRP2	% of machines grouped for products or customers	31
MKTG1	Use of direct mail, phone calls to customers	21
MKTG2	Participation in trade shows, advertisements in trade journals	21
MKTG3	Salespeople calls to customers	21
MKTG4	Top management involvement in getting new business	21
MKTG5	Use of the Internet for getting new business	21
MKTG6	Word of mouth for getting new business	21
MMC_GRP2	Binary variable for missing values in MC_GRP2	31

Variable name	Variable description	Question no.
MPR_CHGE	Binary variable for the applicability of changes in major product line(s)	7
PR_TYPE1	% of products tailor-made to a customer's specific request	13
PR_TYPE2	% of products produced to a customer's order from a catalogue or a standard product listing	13
PR_TYPE3	% of products made for finished goods stock without a specific customer order	13
RE_SIZE1	Average employment size of major competitors relative to the SMM	12
RE_SIZE2	Average employment size of major customers relative to the SMM	12
SALES	% change in sales (3 years)	5
SCHEDULE	Frequency of changes in customer schedules after the start of production	29
SUB	Share of value added in the supply chain	14
TAC1	Quantify the impact from the use of your product on customer's performance	22
TAC2	Suggest how cost savings can be made over the years	22
TAC3	Provide information about future technological developments for this product	22
TIME	% of time working with major customers on coordination vs.control tasks	25
V_FOCUS1	Assistance in applications development	15
V_FOCUS2	Formal product design and development	15
V_FOCUS3	Influence product design (if not formally undertaken)	15
V_FOCUS4	Education/training in product use	15
V_FOCUS5	Consulting in areas that the company has expertise	15

APPENDIX C
COMPLIANCE WITH THE ASSUMPTIONS OF MULTIPLE
REGRESSION ANALYSIS

Appendix C: Compliance with the assumptions of multiple regression analysis

The assumptions to examine are linearity, homoscedasticity, and normality. The principal measure used is the residual – the difference between the actual dependent variable value and its predicted value. Two types of plots are employed:

Plots of residuals versus the predicted values: Plotting the residuals versus the predicted values is a basic method of identifying violations for the overall relationship as described by the overall equation. The null plot is the plot of residuals when all assumptions are met. The null plot shows the residuals falling randomly, with relatively equal dispersion around zero and no strong tendency to be either greater or less than zero.

Partial residuals plots: A partial residual plot is a scatterplot of residuals of the dependent variable and an independent variable when both are regressed separately on the rest of the independent variables. This removes the linear effect of the other independent variables from both variables.

The following checks are made for each assumption:

Linearity

Linearity is assessed through an analysis of residuals for the overall equation and partial residuals plots for each independent variable in the equation, looking for nonlinear patterns.

Homoscedasticity

Homoscedasticity in the multivariate case, that is, the constancy of residuals across values of the independent variables is assessed through the residuals plot for the overall equation.

Normality

Normality of the error term of the variate is assessed through a visual examination of the normal probability plots of the residuals as well as the frequency histograms of the residuals.

Influential observations

As Hair et al. [1998] suggest, observations may be classified as influential even though they are not recognised as outliers. This is the case when an influential observation has influenced the regression estimation to such a degree that its residual is negligible. Partial residuals plots offer an initial visual check on the existence of influential observations. In order to identify outliers, leverage points and influential observations a series of diagnostic measures is employed. These are illustrated in Table C.1.

Diagnostic measure	Threshold Value Specification
<i>Residuals</i>	
Standardised	Critical t value at specified confidence level
Studentised	Critical t value at specified confidence level
Studentised deleted	Critical t value at specified confidence level
<i>Leverage</i>	
Hat values	Small sample: $3(k+1) / n$ Medium/large sample: $3(k+1) / n$
Mahalanobis distance	Evaluate the distribution of values
<i>Single-case measures</i>	
SDFBETA	Small sample: Critical t value at specified confidence level Medium/large sample: $2 / \sqrt{n}$
Cook's distance	$4 / (n-k-1)$
COVRATIO	$1 \pm 3(k+1)/n$
SDFFIT	$2\sqrt{((k+1)/(n-k-1))}$
n = sample size	
k = number of independent variables	

Table C.1 Diagnostic measures used for detecting influential variables

In order to test for the effect of influential observations on the study results regression analysis is performed after omitting cases that the diagnostic measures consistently

point as influential ones. Results obtained are then compared with results from the analysis of the entire data set.

The following sections illustrate the checks performed in order to test for the compliance of the regression models with the assumptions of multiple regression analysis as well as the analysis performed to identify influential observations and to assess their potential impact on the study results.

DEPENDENT VARIABLE: CONTRCT1

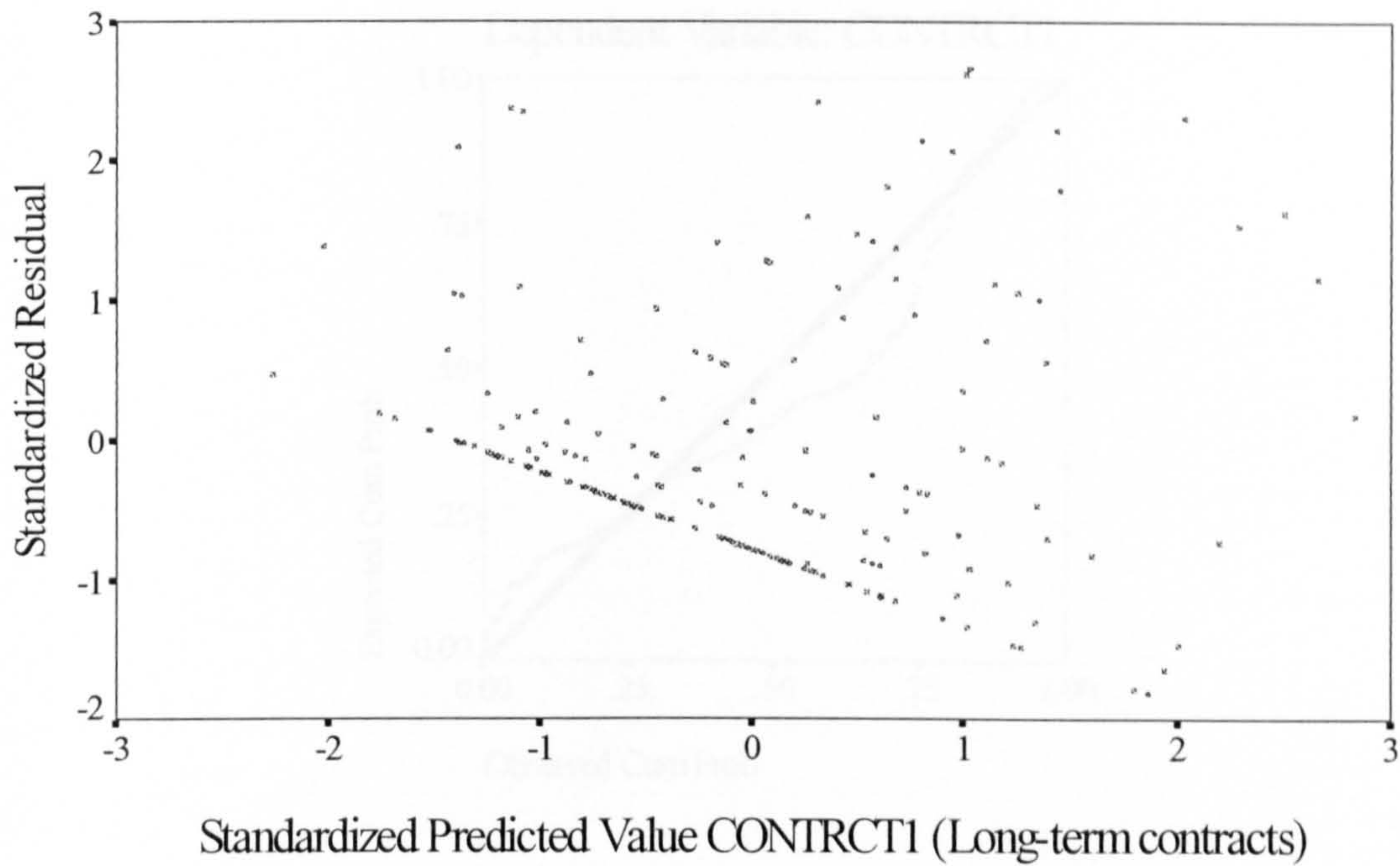


Figure C.1 Residuals plot for Equation 1 (CONTRCT1)

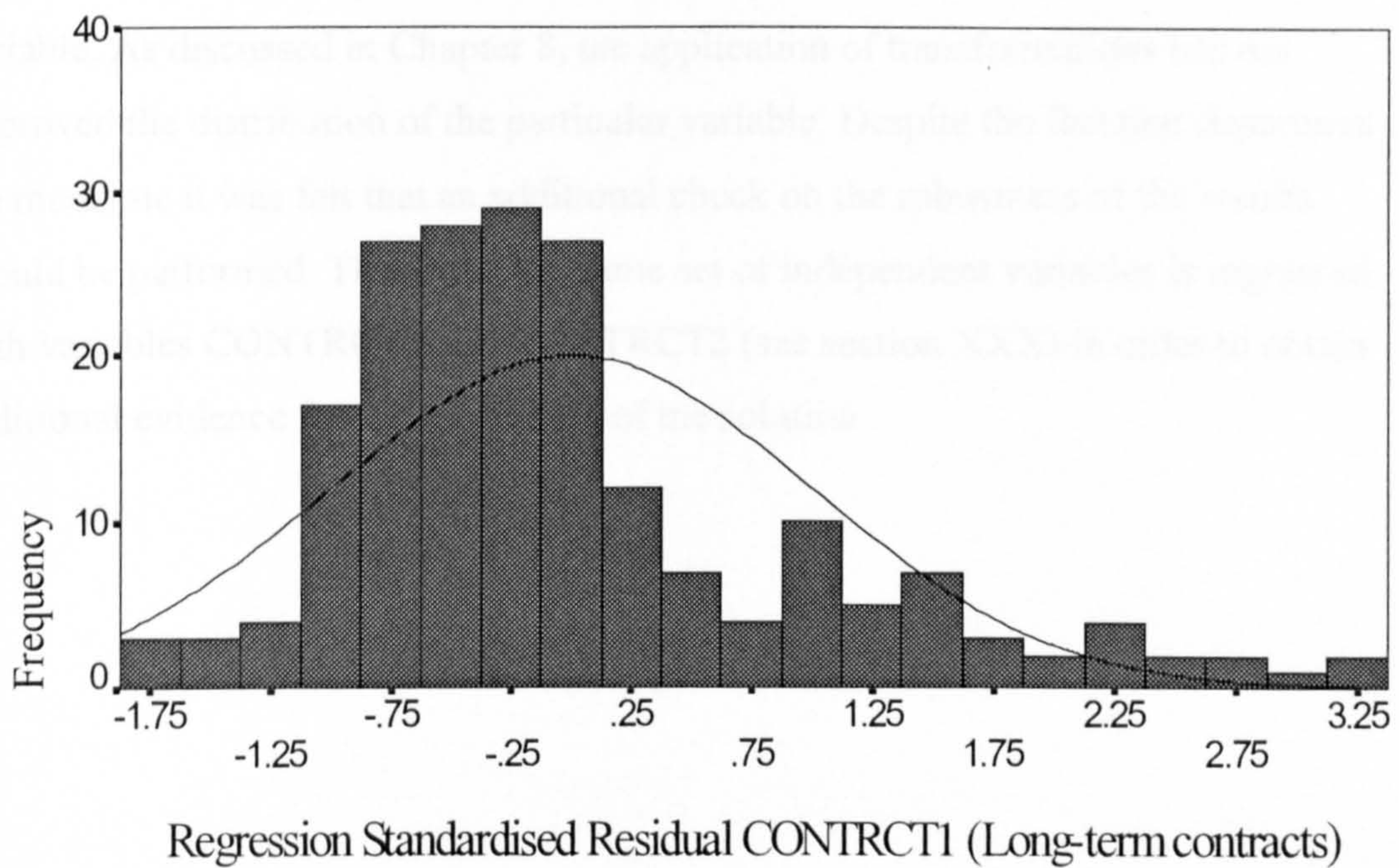


Figure C.2 Frequency histogram of the residuals for Equation 1 (CONTRCT1)

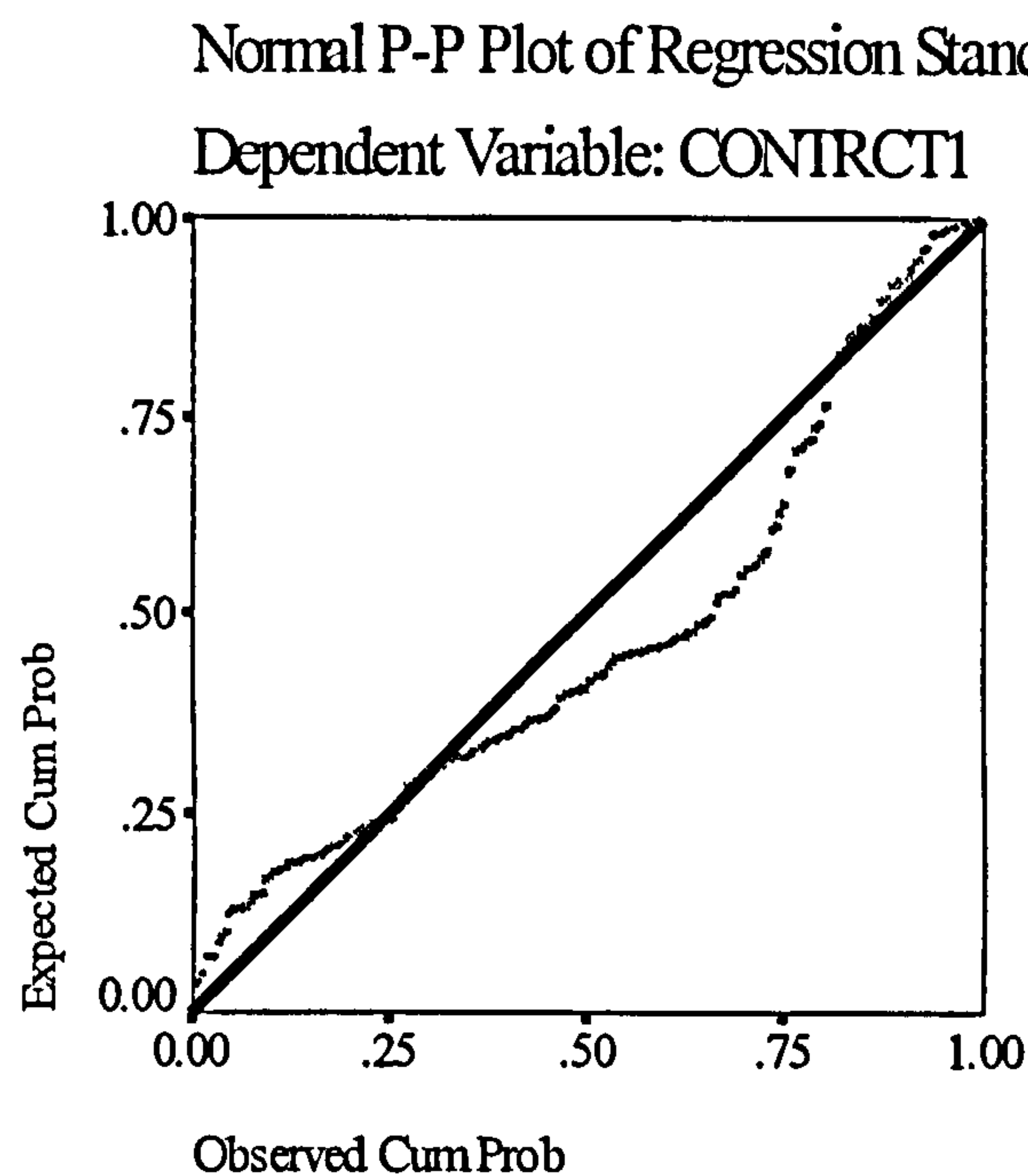


Figure C.3 Normal probability plot for Equation 1 (CONTRCT1)

Figures C.1 to C.3 show a moderate departure from the assumptions of regression analysis. The underlying reason is the skewness of the distribution of the CONTRCT1 variable. As discussed in Chapter 8, the application of transformations has not improved the distribution of the particular variable. Despite the fact that departures are moderate it was felt that an additional check on the robustness of the results should be performed. Therefore, the same set of independent variables is regressed with variables CONTRCT3 and CONTRCT2 (see section XXX) in order to obtain additional evidence for the robustness of the solution.

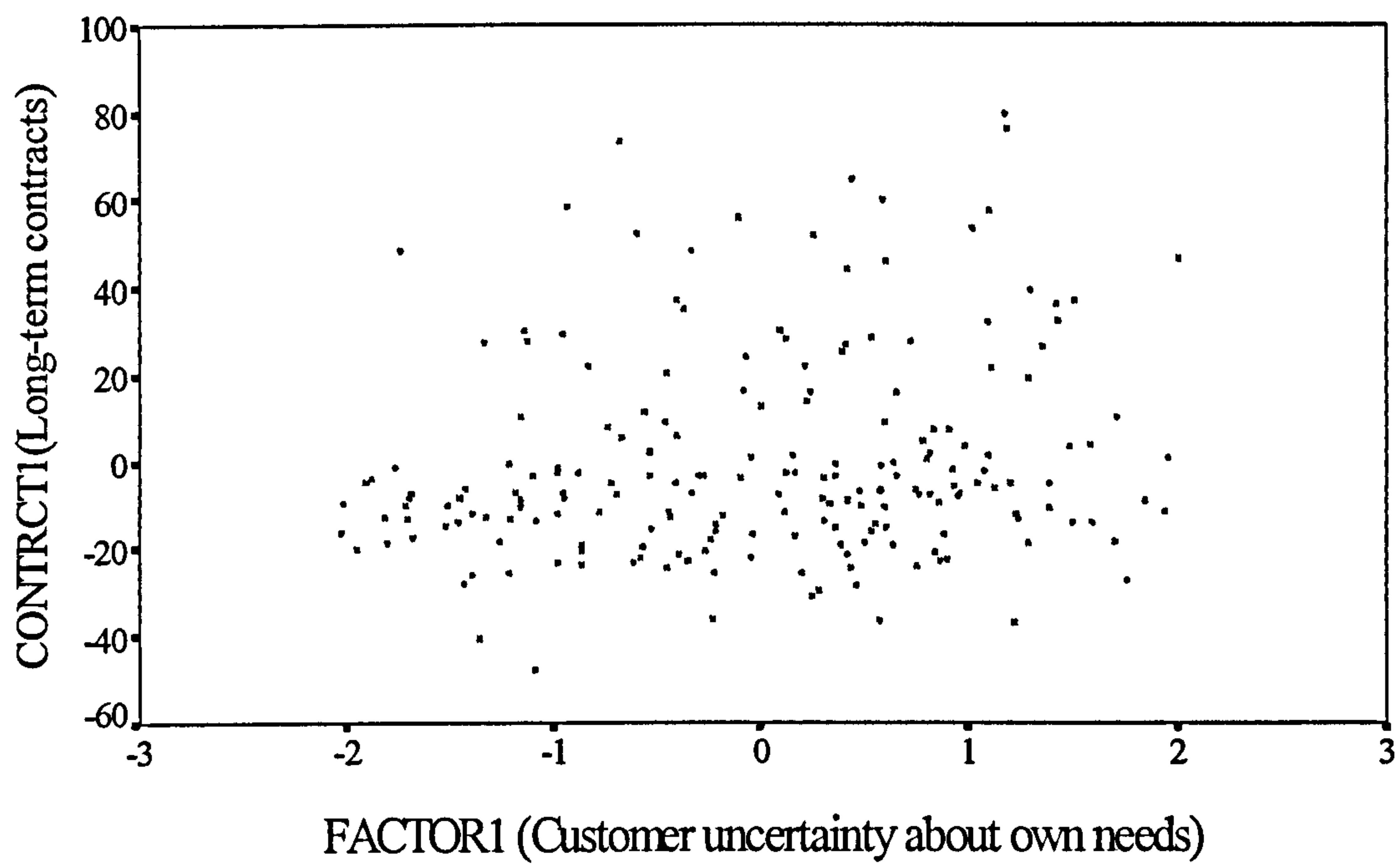


Figure C.4 Partial residual plot of FACTOR1 and CONTRCT1

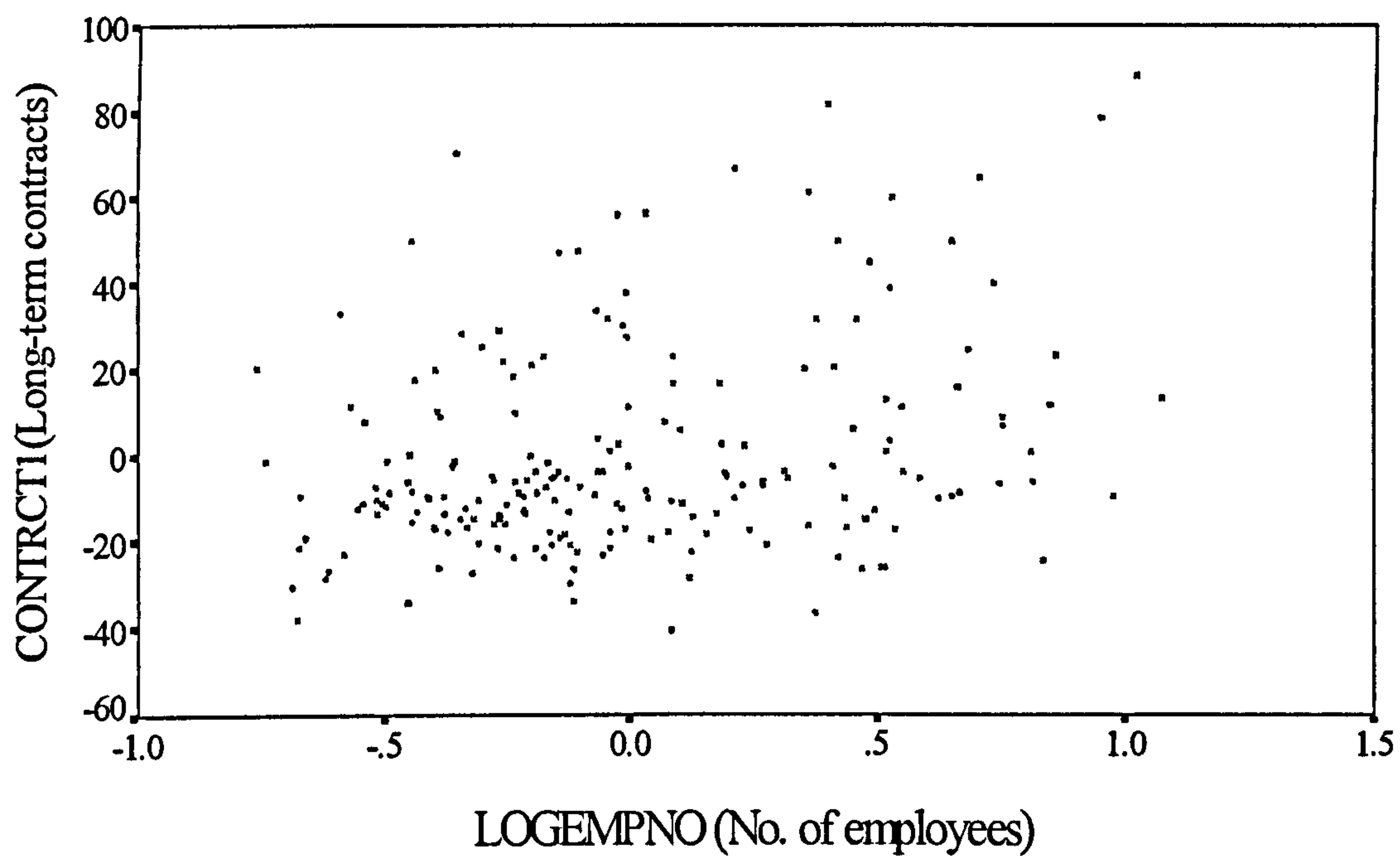


Figure C.5 Partial residual plot of LOGEMPNO and CONTRCT1

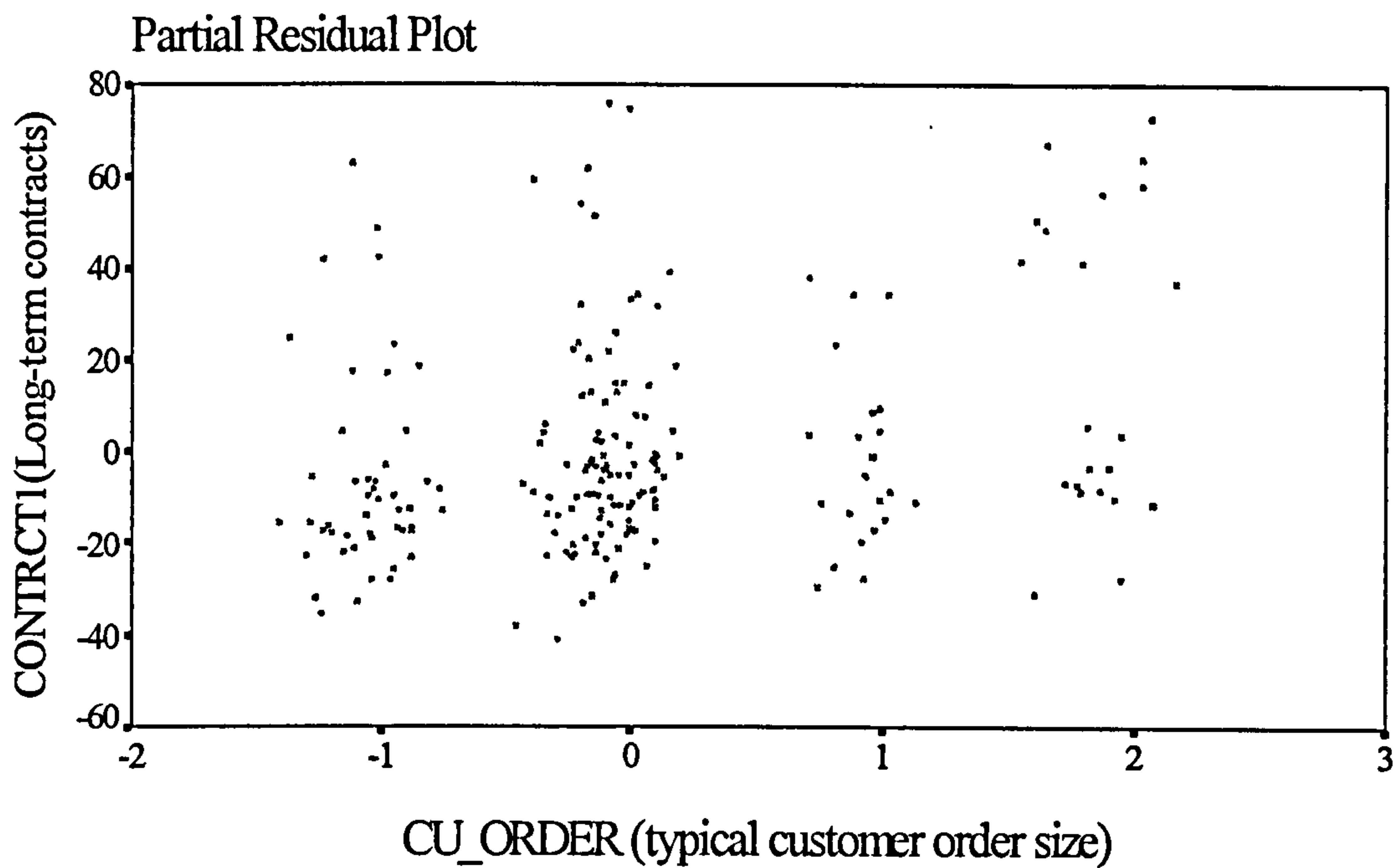


Figure C.6 Partial residual plot of CU_ORDER and CONTRCT1

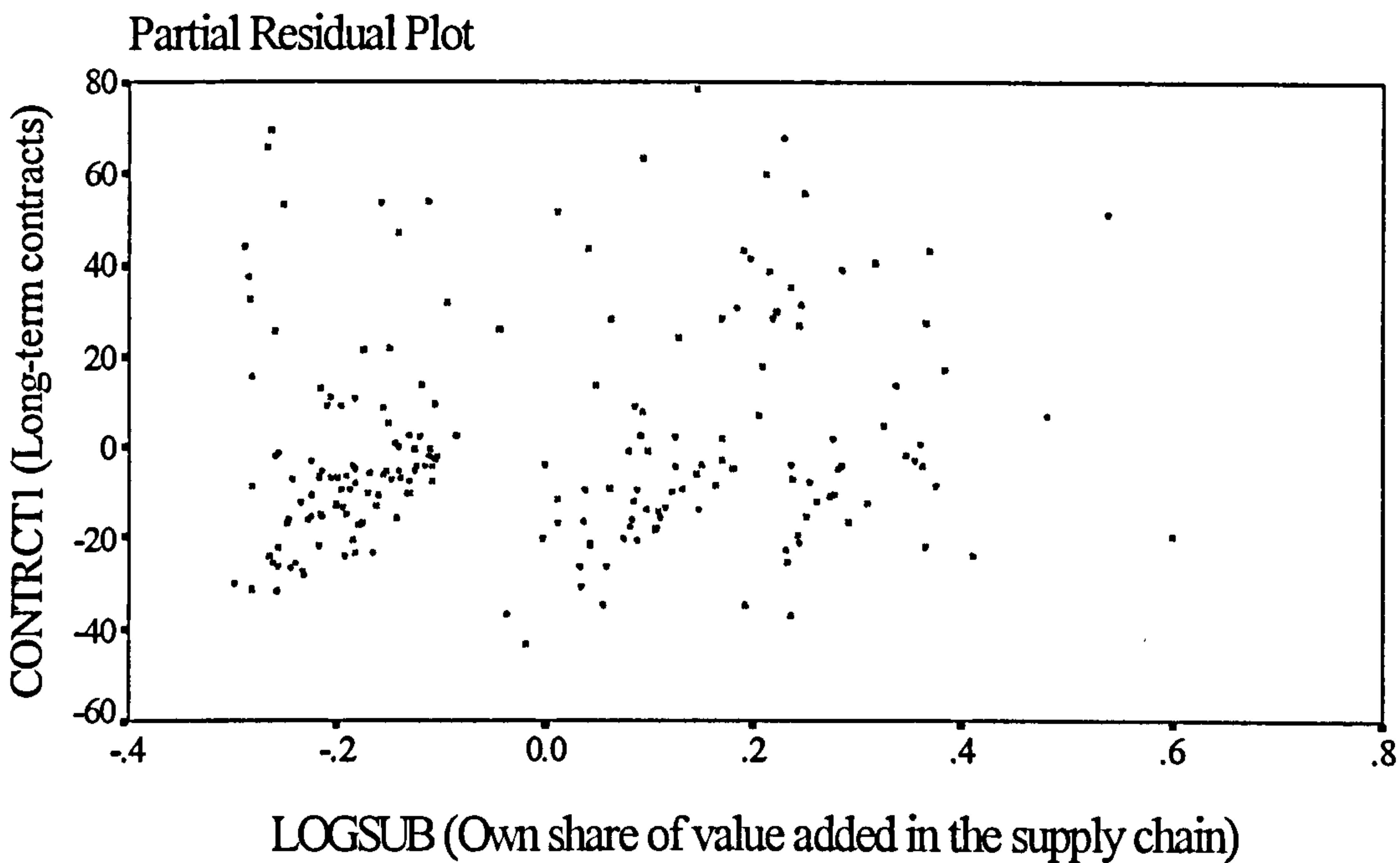


Figure C.7 Partial residual plot of LOGSUB and CONTRCT1

The examination of the partial regression plots does not indicate the existence of any nonlinear patterns in the relationships between the dependent variable and individual independent variables. They do however indicate that there are some influential observations in the data set warranting further investigation.

The application of the diagnostic measures shown in Table C.1, did not identify any observations as consistently influential across the whole set of fifteen measures. The analysis showed eight observations that are relatively more frequently designated as influential observations. The multiple regression analysis was performed after omitting these eight observations and the results obtained are illustrated below:

Dependent variable	Hypothesised influences (significant)	Estimated coefficients (standardised)	P value	R ²	R ² adj
CONTRCT1	FACTOR1	$\beta_{11} = 0.15$	0.0211	0.209	0.192
	LOGSUB	$\beta_{12} = 0.18$	0.0067		
	CU_ORDER	$\beta_{15} = 0.24$	0.0003		
	LOGEMPNO	$\beta_{19} = 0.23$	0.0006		

Table C.2 Results of multiple regression analysis for CONTRCT1 after omitting influential observations

As illustrated in Table C.2 the model estimated after the influential cases are eliminated does not differ from the original model in terms of significant influences and levels of significance. The change in the value of R² adj, from 0.211 in the original sample to 0.192, is marginal. A case-by-case examination of the influential observations does not reveal any theoretical reasons on which their final exclusion from the study could be based. Given that removing some influential observations does not result in the strengthening of relationships the decision to retain the original model is reached in order to enhance generalisability of the results.

Additional analysis to ensure the robustness of the solution for CONTRCT1

The analysis identified a moderate departure from the assumptions of multiple regression analysis for the regression variate used to predict variable CONTRCT1. In order to provide further assurance for the robustness of the solution obtained, the same set of independent variabels is regressed against the variables CONTRCT3 and CONTRCT2. CONTRCT3 measures the percent of sales covered by individual sales orders. It is therefore expected that the same set of independent variables as in the case of CONTRCT1, but in the opposite direction, will be found to significantly influence CONTRCT3. The variable CONTRCT2 measures the percent of sales covered by short-term purchase orders. As an intermediate level of customer commitment it is expected to be influenced from a subset of variables that influence CONTRCT1 and CONTRCT3.

Equations 11 and 12 illustrate the relationships tested:

$$\begin{aligned} \text{CONTRCT3} = & \beta_{11,0} + \beta_{11,1} \text{FACTOR1} + \beta_{11,2} \text{LOGSUB} + \beta_{11,3} \text{FACTOR5} + \beta_{11,4} \\ & \text{RELPERF} + \beta_{11,5} \text{CU_ORDER} + \beta_{11,6} \text{C_ORDER} + \beta_{11,7} \text{COMP_NO} + \\ & \beta_{11,8} \text{RE_SIZE1} + \beta_{11,9} \text{LOGEMPNO} \end{aligned} \quad (\text{Eq. 11})$$

$$\begin{aligned} \text{CONTRCT2} = & \beta_{12,0} + \beta_{12,1} \text{FACTOR1} + \beta_{12,2} \text{LOGSUB} + \beta_{12,3} \text{FACTOR5} + \beta_{12,4} \\ & \text{RELPERF} + \beta_{12,5} \text{CU_ORDER} + \beta_{12,6} \text{C_ORDER} + \beta_{12,7} \text{COMP_NO} + \\ & \beta_{12,8} \text{RE_SIZE1} + \beta_{12,9} \text{LOGEMPNO} \end{aligned} \quad (\text{Eq.12})$$

Table C.3 summarises the results of the multiple regression analysis.

Dependent variable	Hypothesised influences (significant)	Estimated coefficients (standardised)	P value	R ²	R ² adj
CONTRCT3	FACTOR1	$\beta_{11,1} = -0.29$	0.0000	0.272	0.261
	LOGSUB	$\beta_{11,2} = -0.13$	0.0650		
	CU_ORDER	$\beta_{11,5} = -0.35$	0.0000		
	LOGEMPNO	$\beta_{11,9} = -0.22$	0.0003		
	FACTOR5	$\beta_{11,3} = -0.10$	0.1502		
	RELPERF	$\beta_{11,4} = -0.07$	0.3253		
	C_ORDER	$\beta_{11,6} = -0.05$	0.4228		
	COMP_NO	$\beta_{11,7} = -0.03$	0.6069		
	RE_SIZE1	$\beta_{11,8} = -0.01$	0.8095		
CONTRCT2	FACTOR1	$\beta_{12,1} = 0.16$	0.0192	0.08	0.07
	RELPERF	$\beta_{12,4} = 0.13$	0.0463		
	CU_ORDER	$\beta_{12,5} = 0.19$	0.0045		
	FACTOR5	$\beta_{12,3} = -0.02$	0.7665		
	LOGSUB	$\beta_{12,2} = 0.00$	0.9201		
	C_ORDER	$\beta_{12,6} = 0.07$	0.3015		
	COMP_NO	$\beta_{12,7} = 0.06$	0.3988		
	RE_SIZE1	$\beta_{12,8} = -0.01$	0.7881		
	LOGEMPNO	$\beta_{12,9} = 0.01$	0.8061		

Table C.3 Results of multiple regression analysis for CONTRCT3 and CONTRCT2

The results shown in Table C.3 increase the confidence in study results regarding the determinants of customer commitment in the form of long-term contracts. The same set of variables, but of course in opposite directions, are shown to significantly influence the extent to which SMMs work on the basis of contracts vs. individual orders. LOGSUB exhibit a weaker relationship ($p \leq 0.10$) with individual orders than with contracts. A subset of these variables appears to explain the achievement of an intermediate level of customer commitment as indicated by the extent of short-term purchase orders.

As shown in the following figures, the estimated models meet the assumptions of multiple regression analysis at an adequate level.

DEPENDENT VARIABLES: CONTRCT3 and CONTRCT2

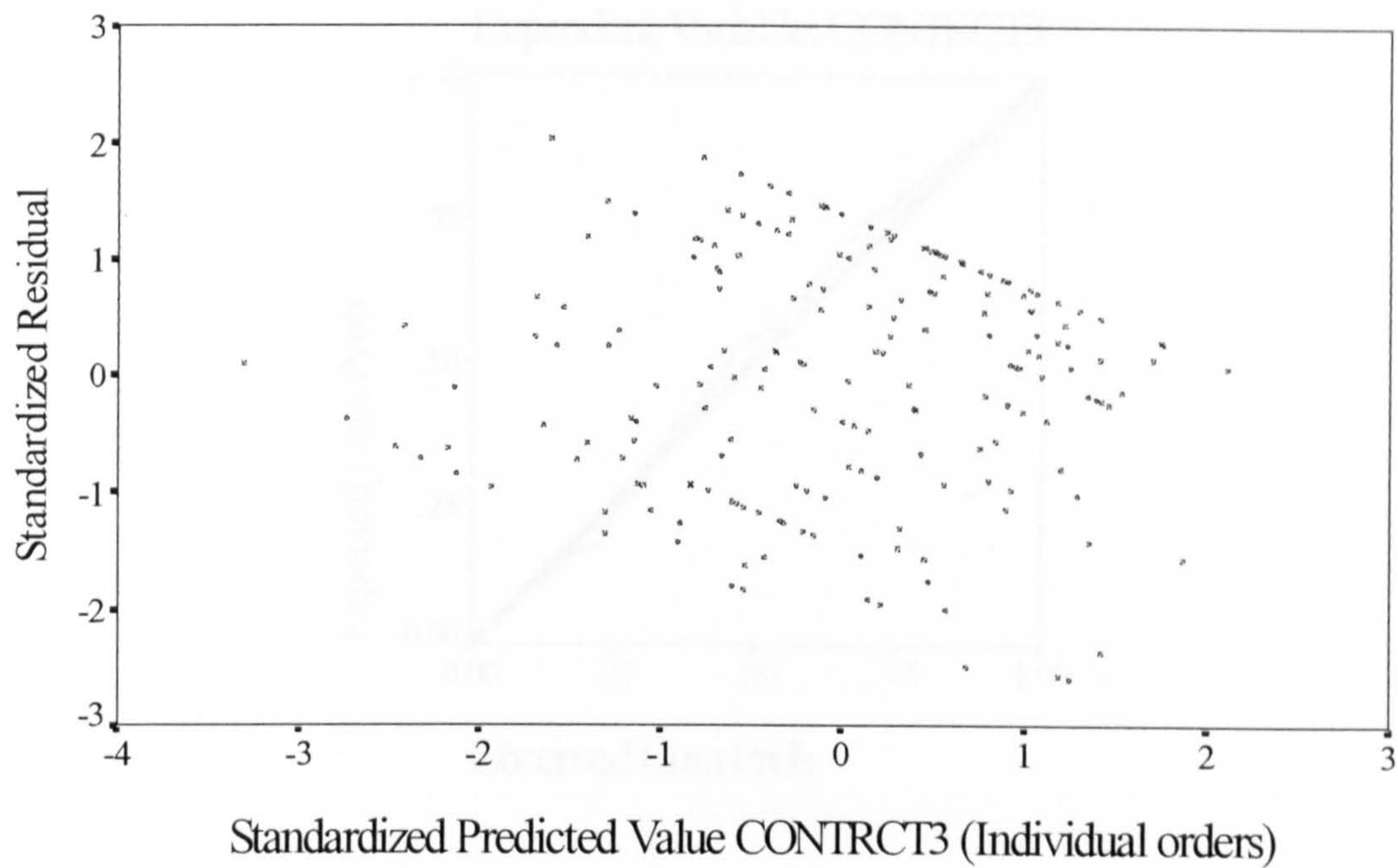


Figure C.8 Residuals plot for Equation 12 (CONTRCT3)

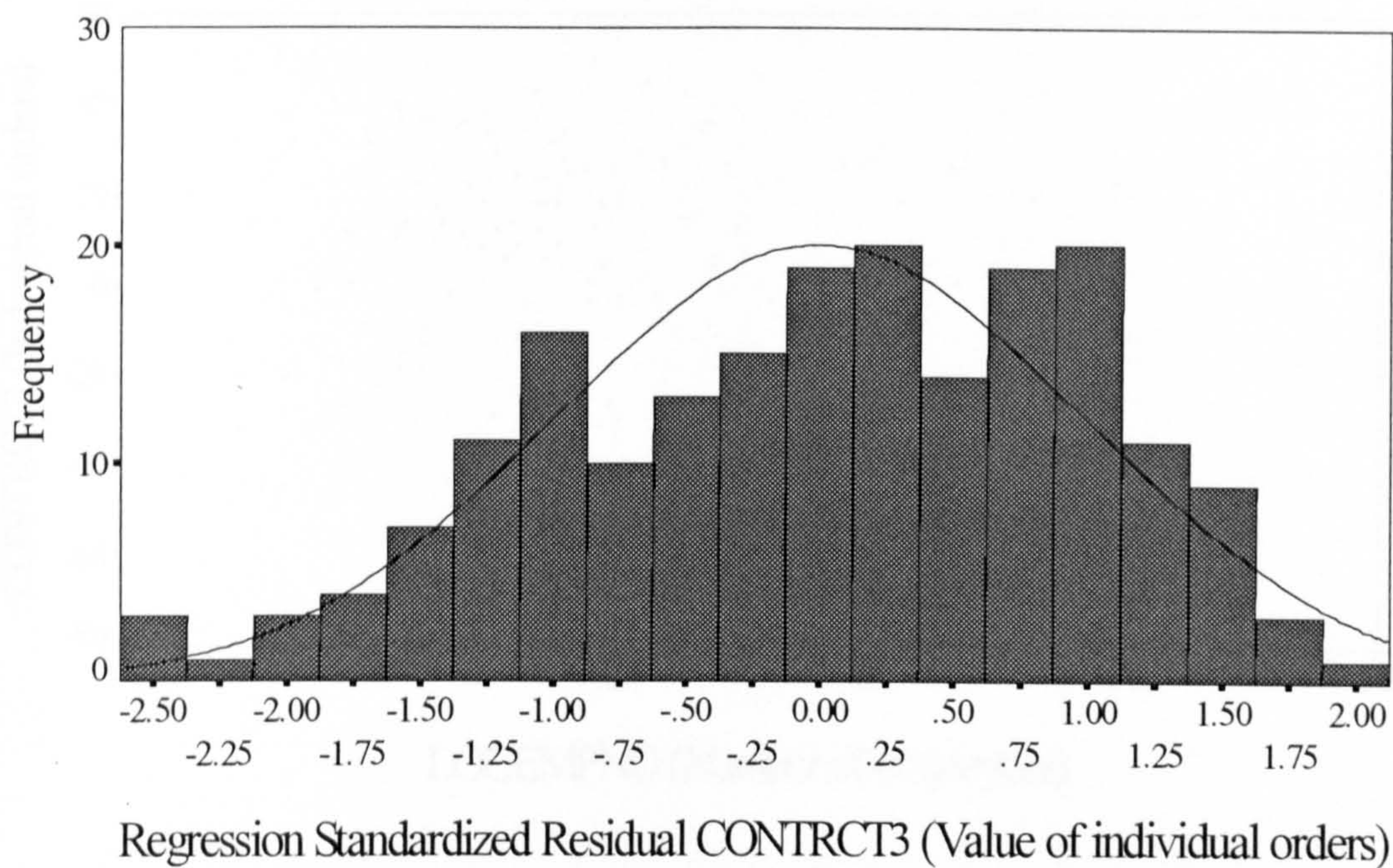


Figure C.9 Frequency histogram of residuals for Equation 11 (CONTRCT3)

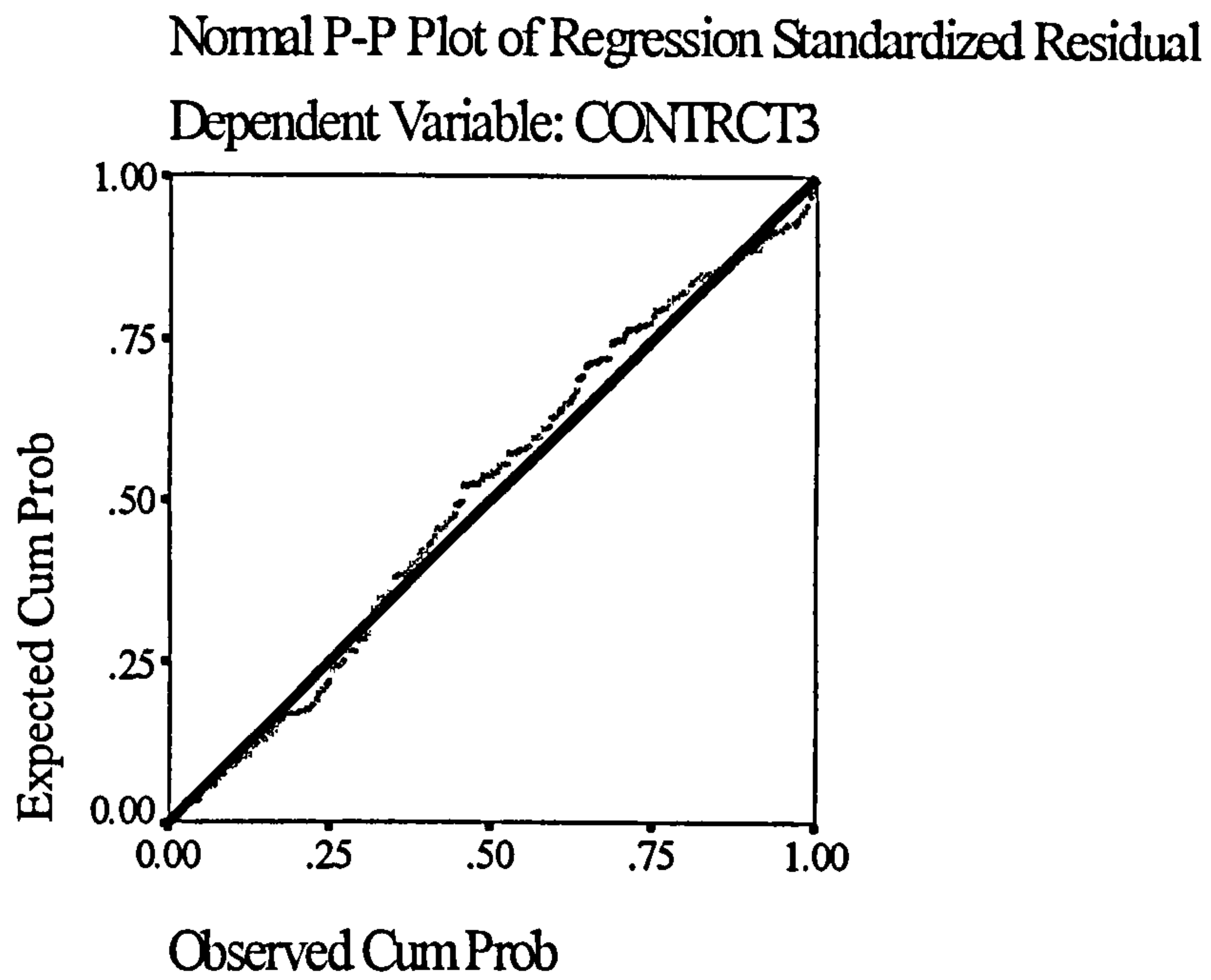


Figure C.10 Normal probability plot for Equation 11 (CONTRCT3)

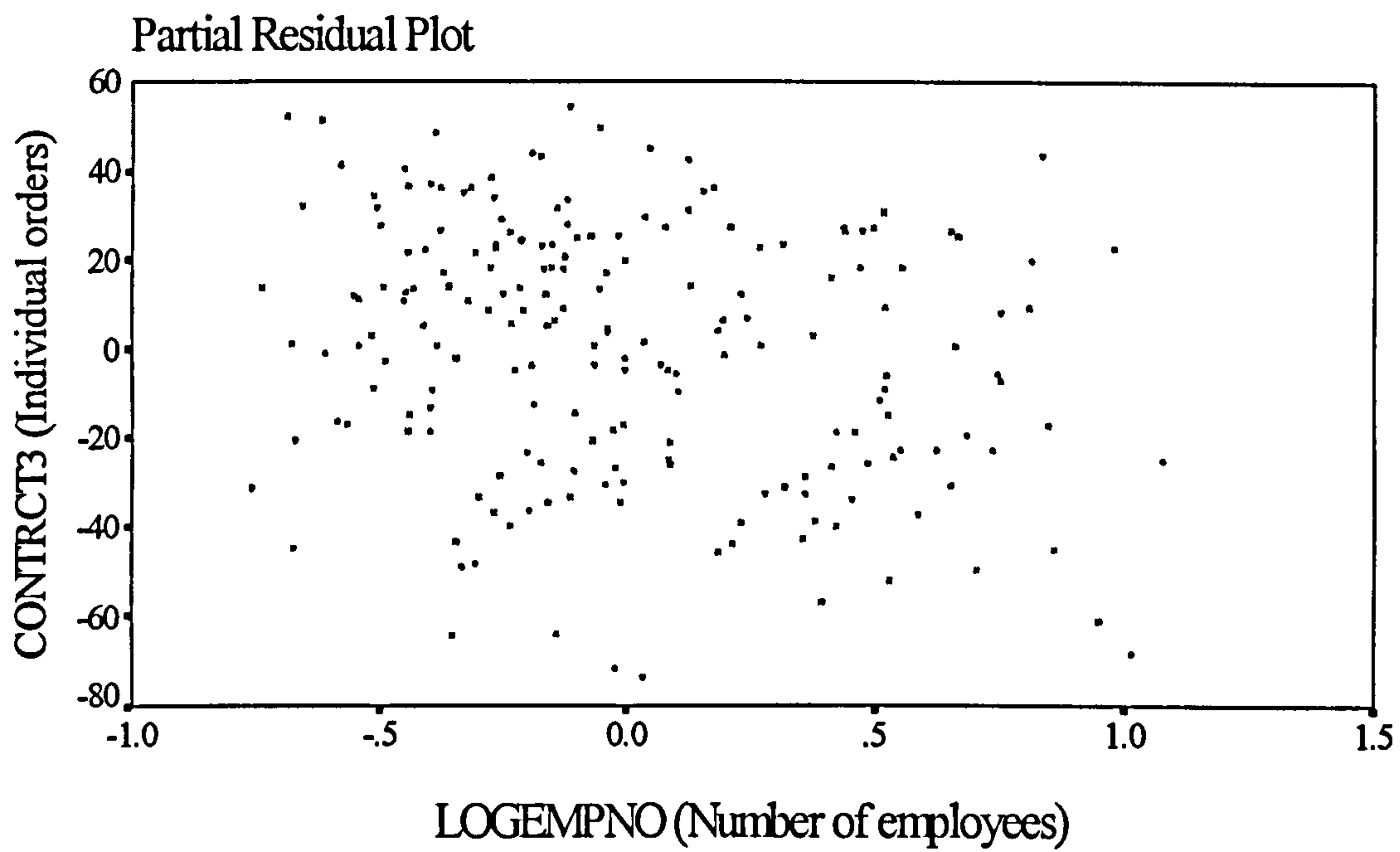


Figure C.11 Partial residual plot of LOGEMPNO and CONTRCT3

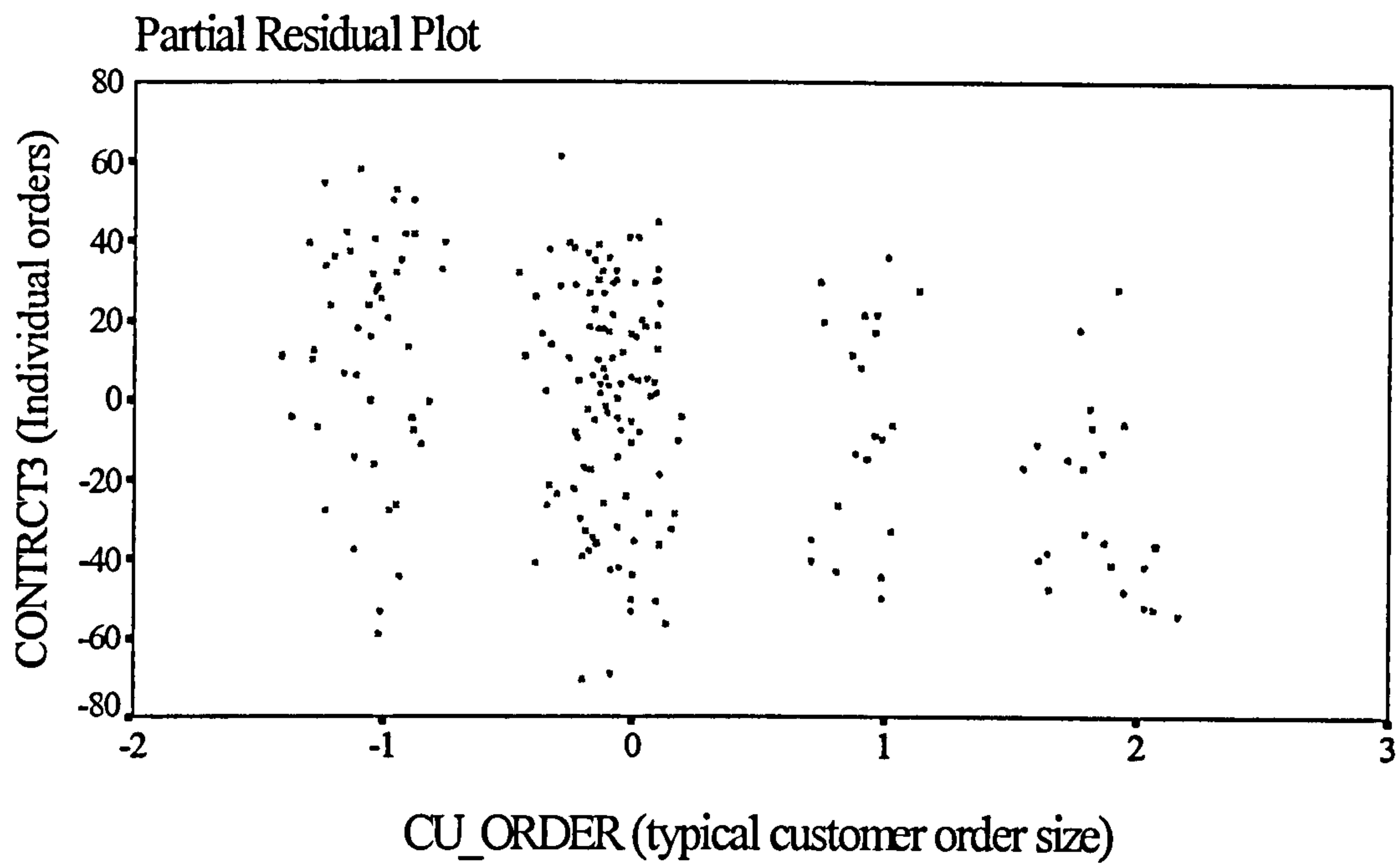


Figure C.12 Partial residual plot of CU_ORDER and CONTRCT3

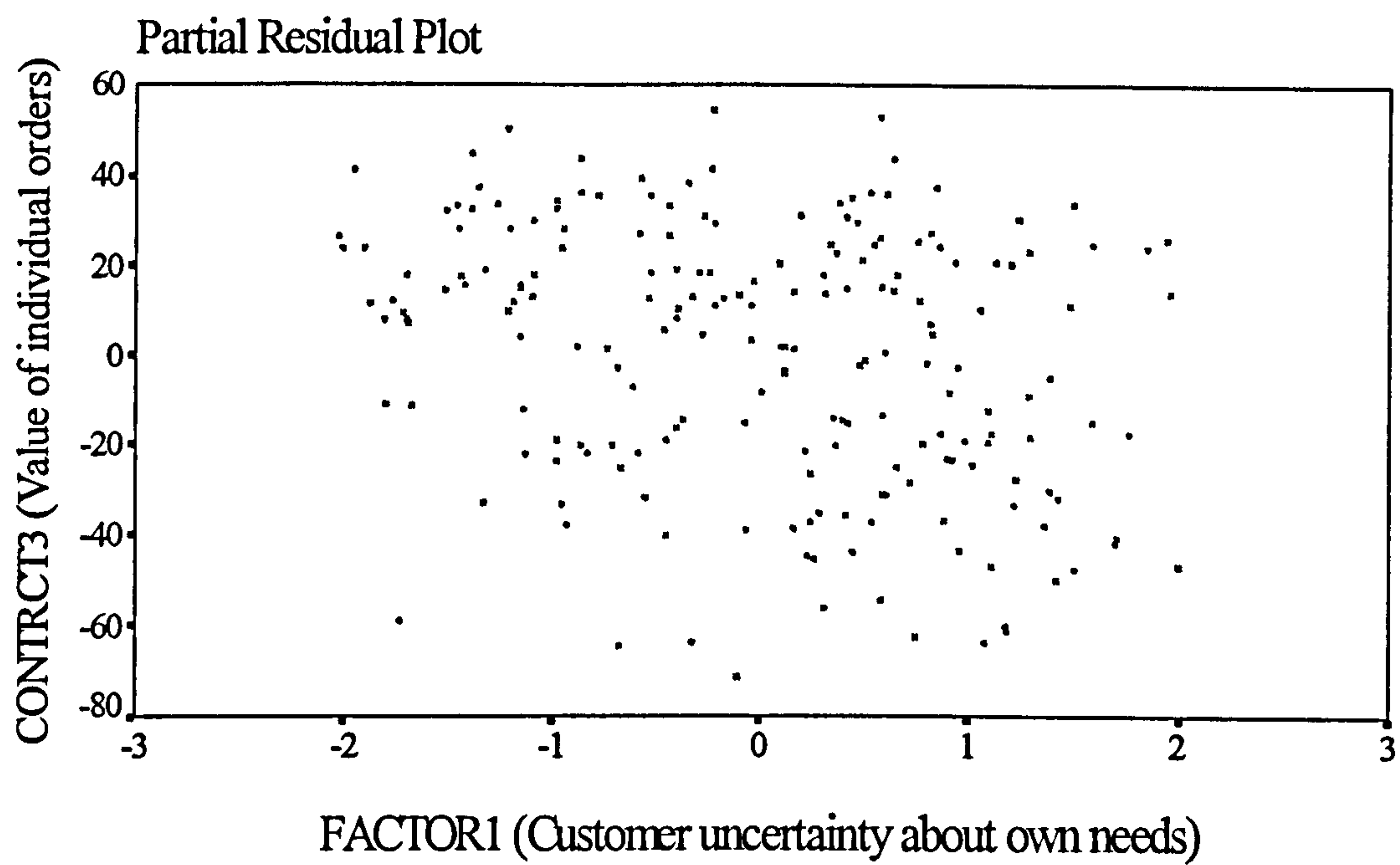


Figure C.13 Partial residual plot of FACTOR1 and CONTRCT3

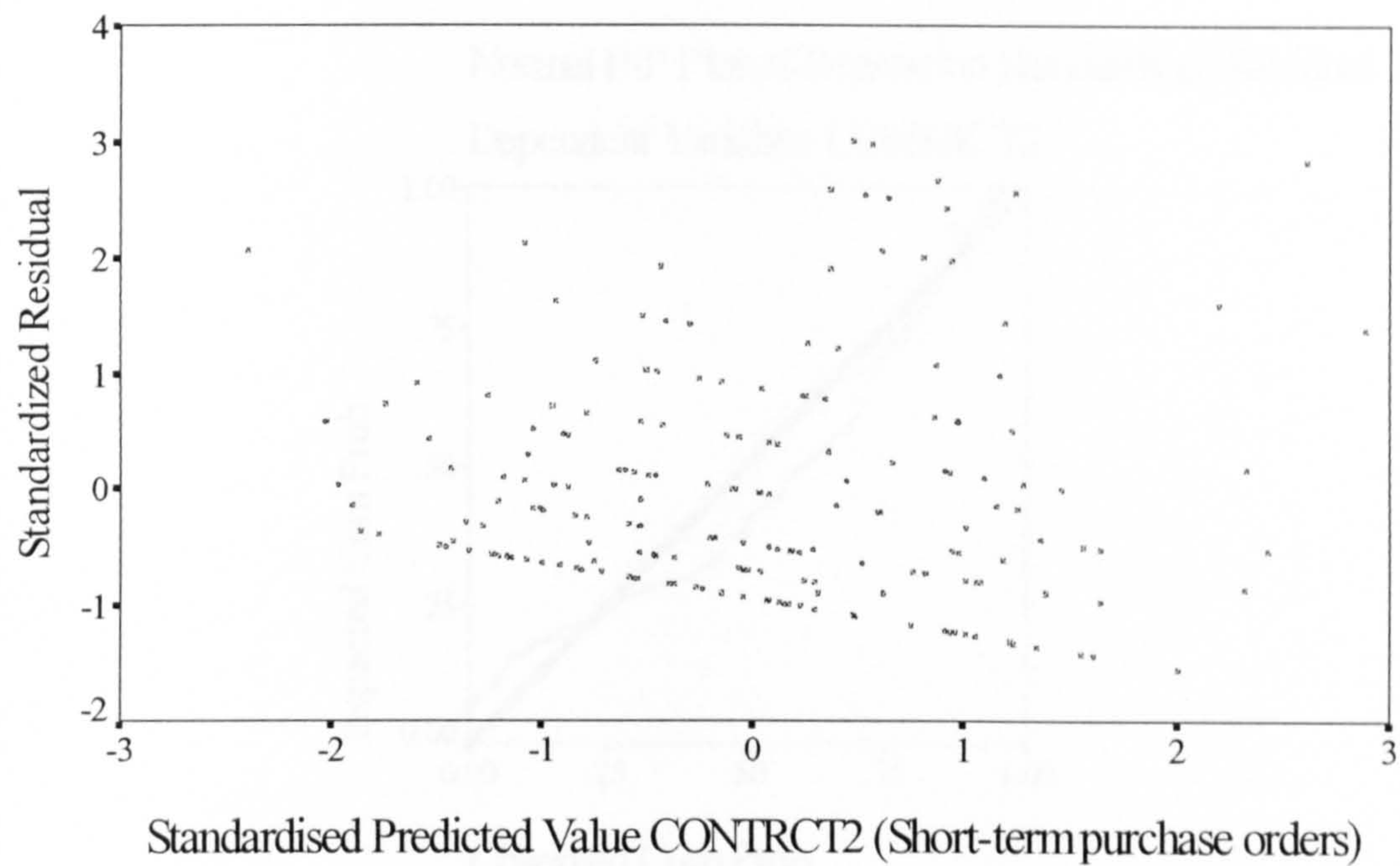


Figure C.14 Residuals plot for Equation 12 (CONTRCT2)

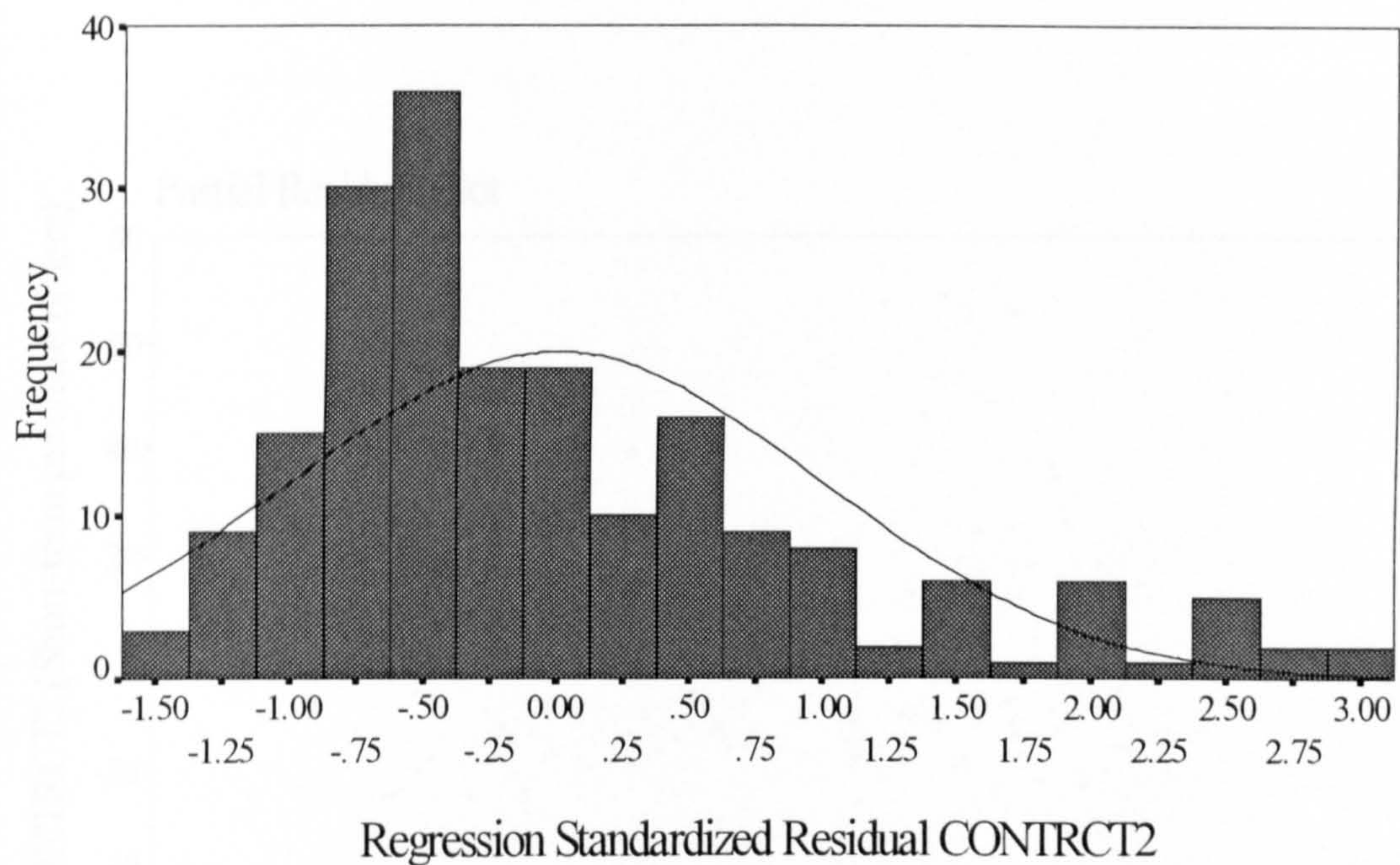


Figure C.15 Frequency histogram for Equation 12 (CONTRCT2)

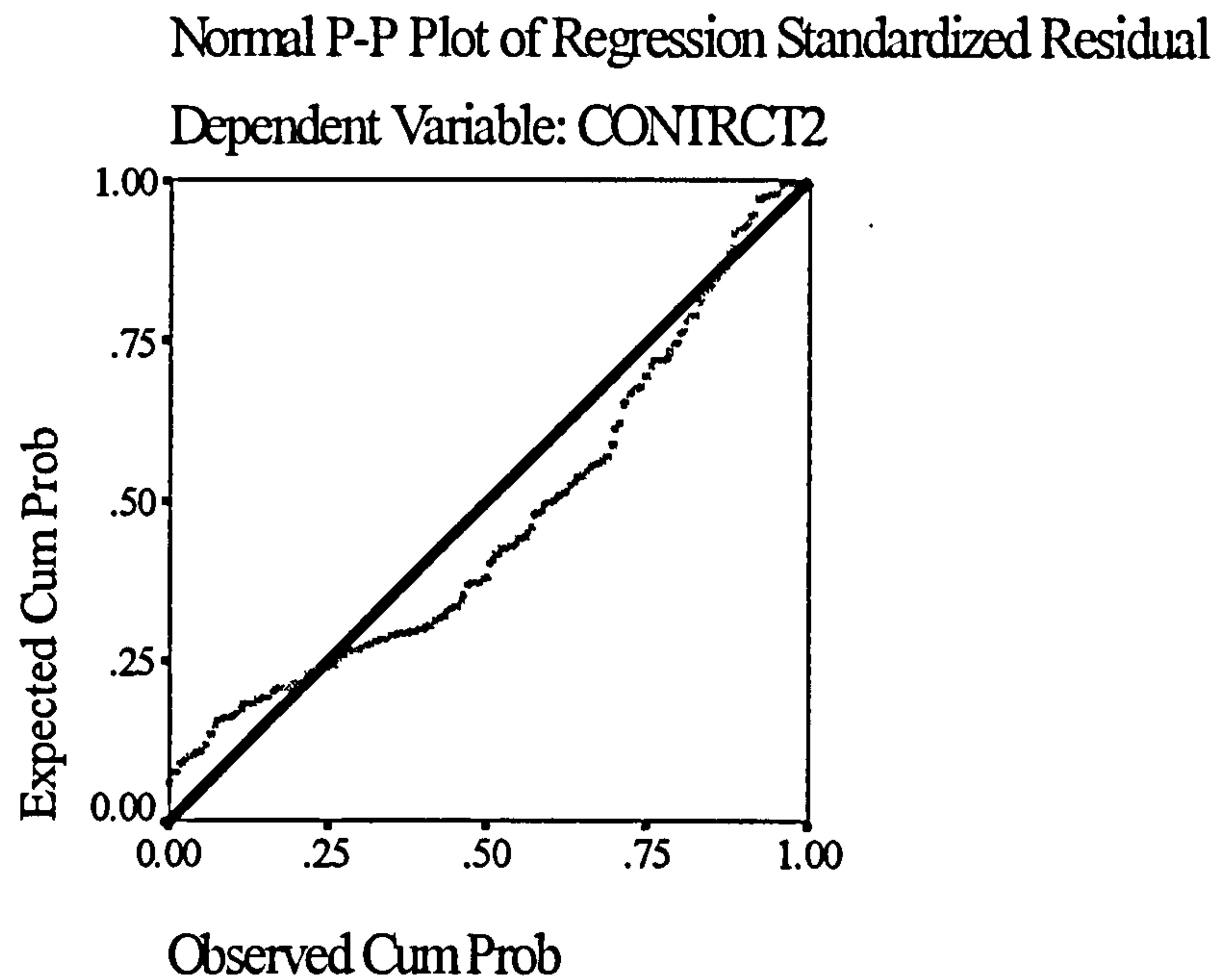


Figure C.16 Normal probability plot for Equation 12 (CONTRCT2)

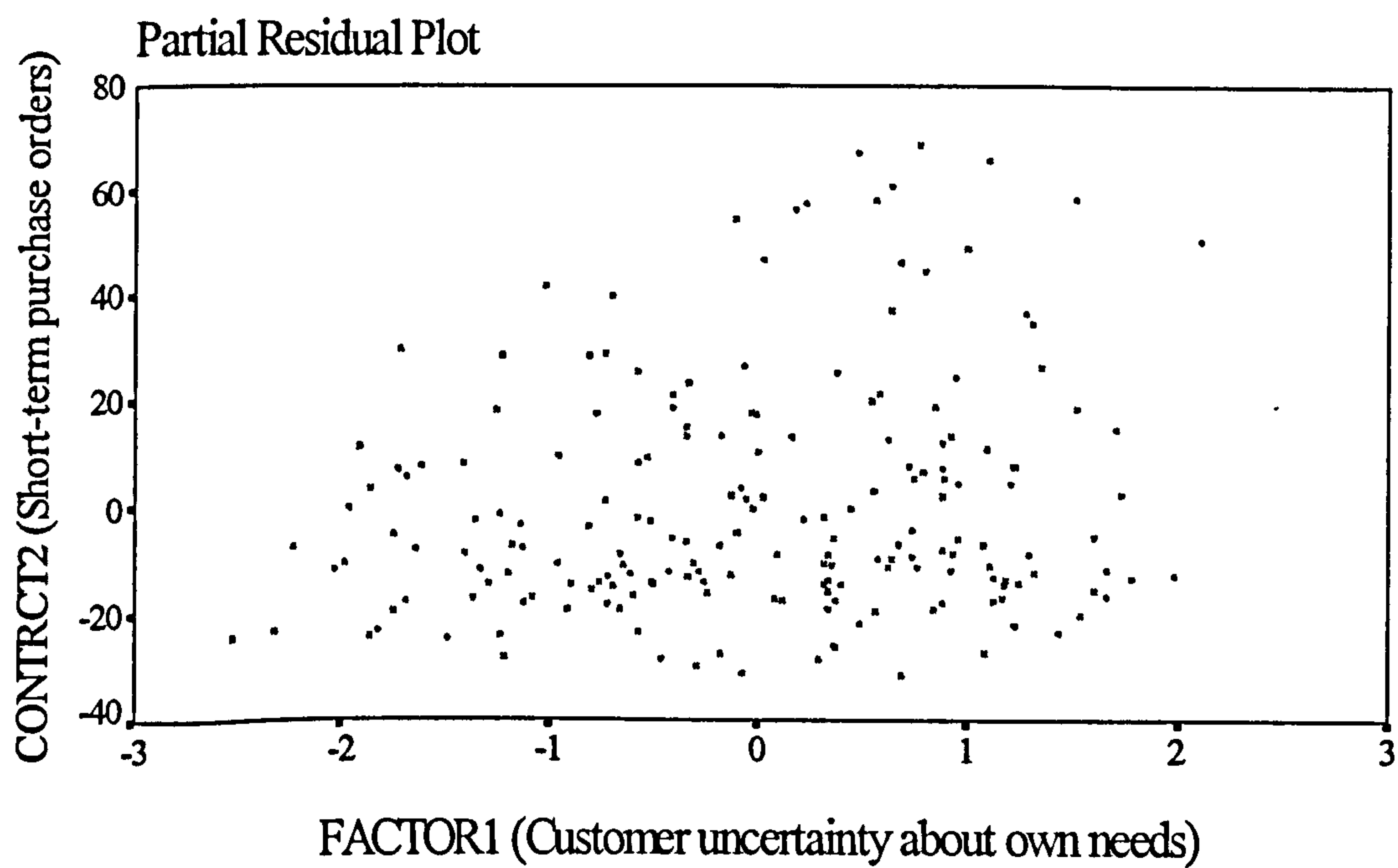


Figure C.17 Partial residual plot of FACTOR1 and CONTRCT2

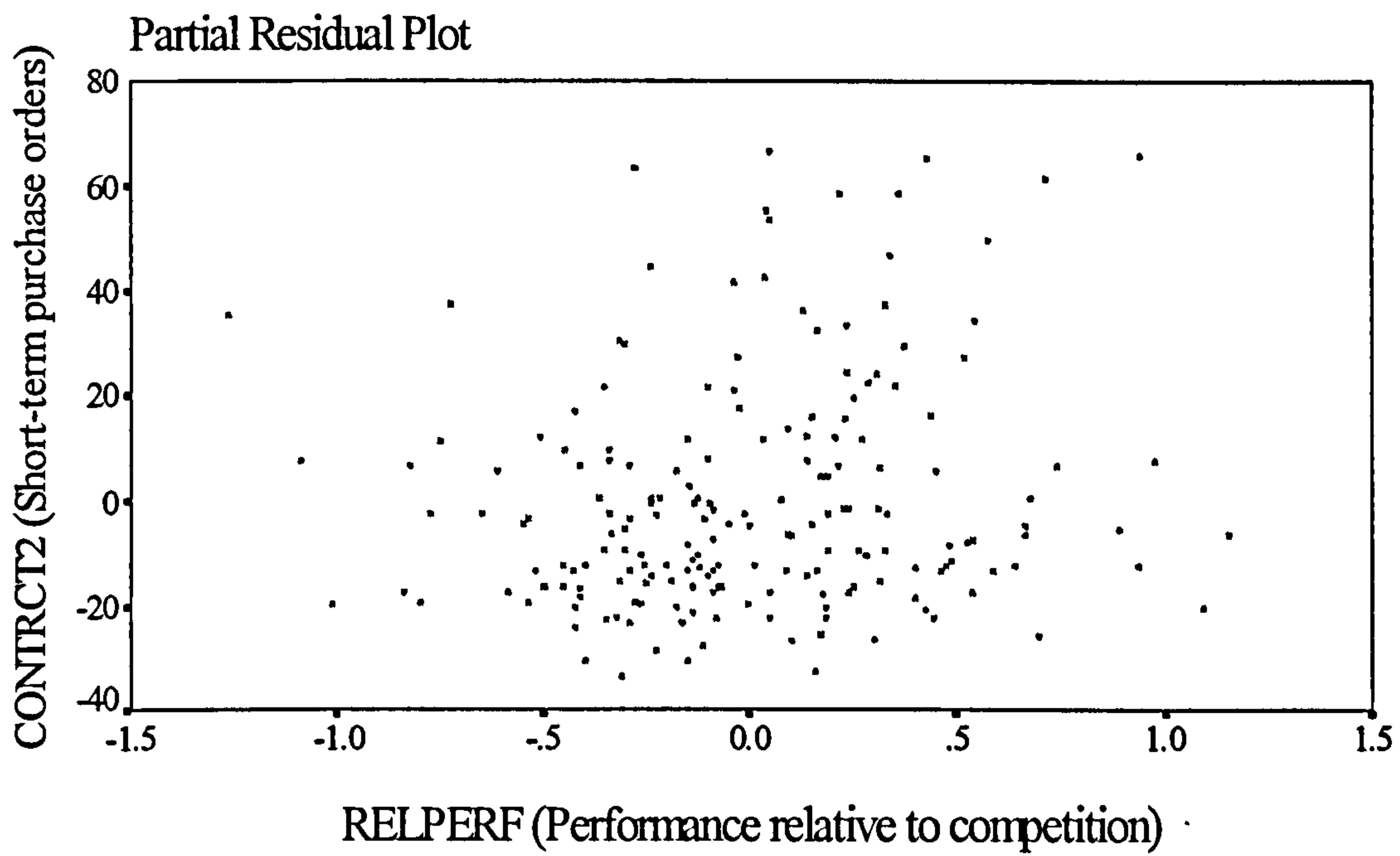


Figure C.18 Partial residual plot of RELPERF and CONTRCT2

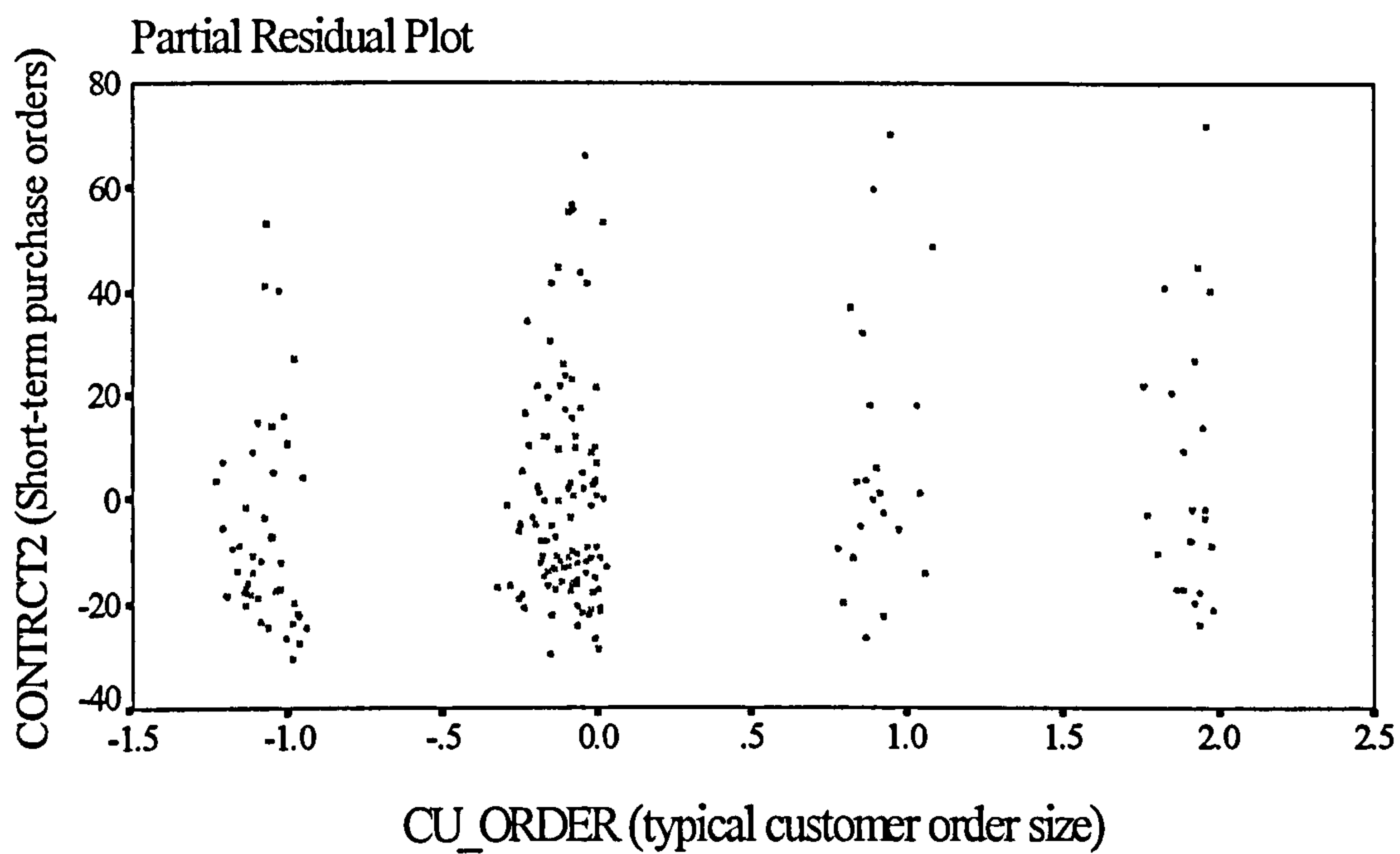


Figure C.19 Partial residual plot of CU_ORDER and CONTRCT2

DEPENDENT VARIABLE : TIME

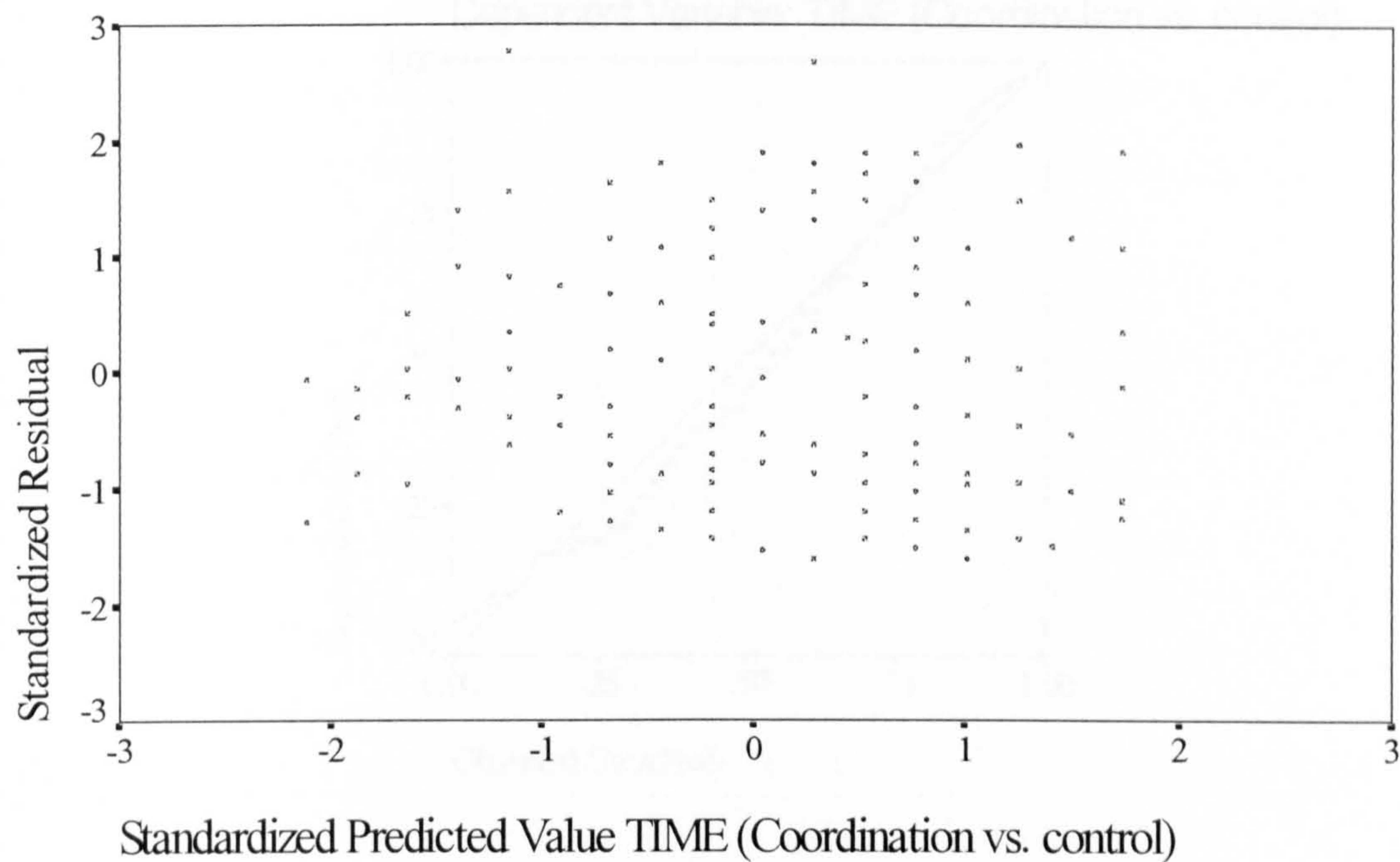


Figure C.20 Residuals plot for Equation 2 (TIME)

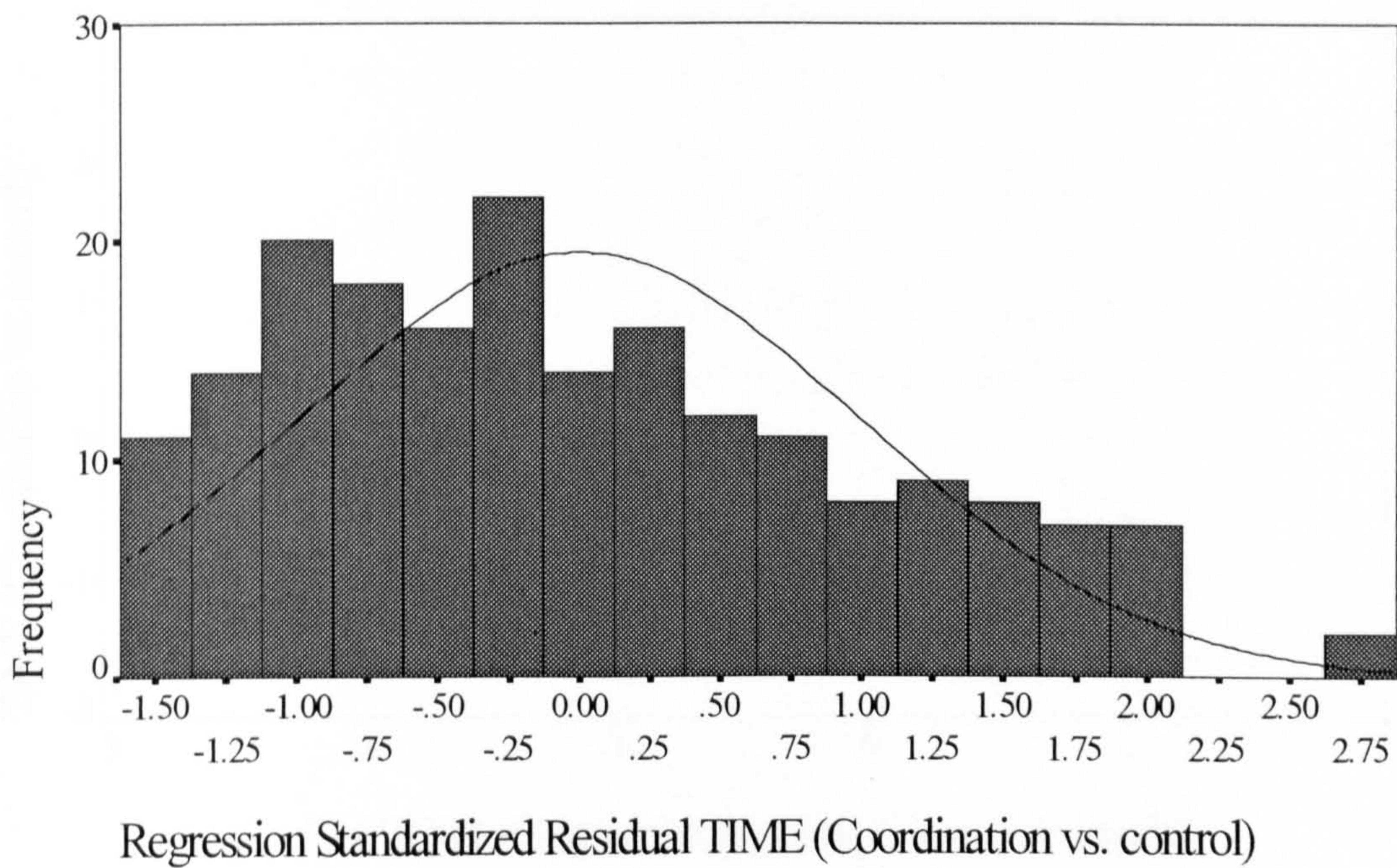


Figure C.21 Histogram of residuals for Equation 2 (TIME)

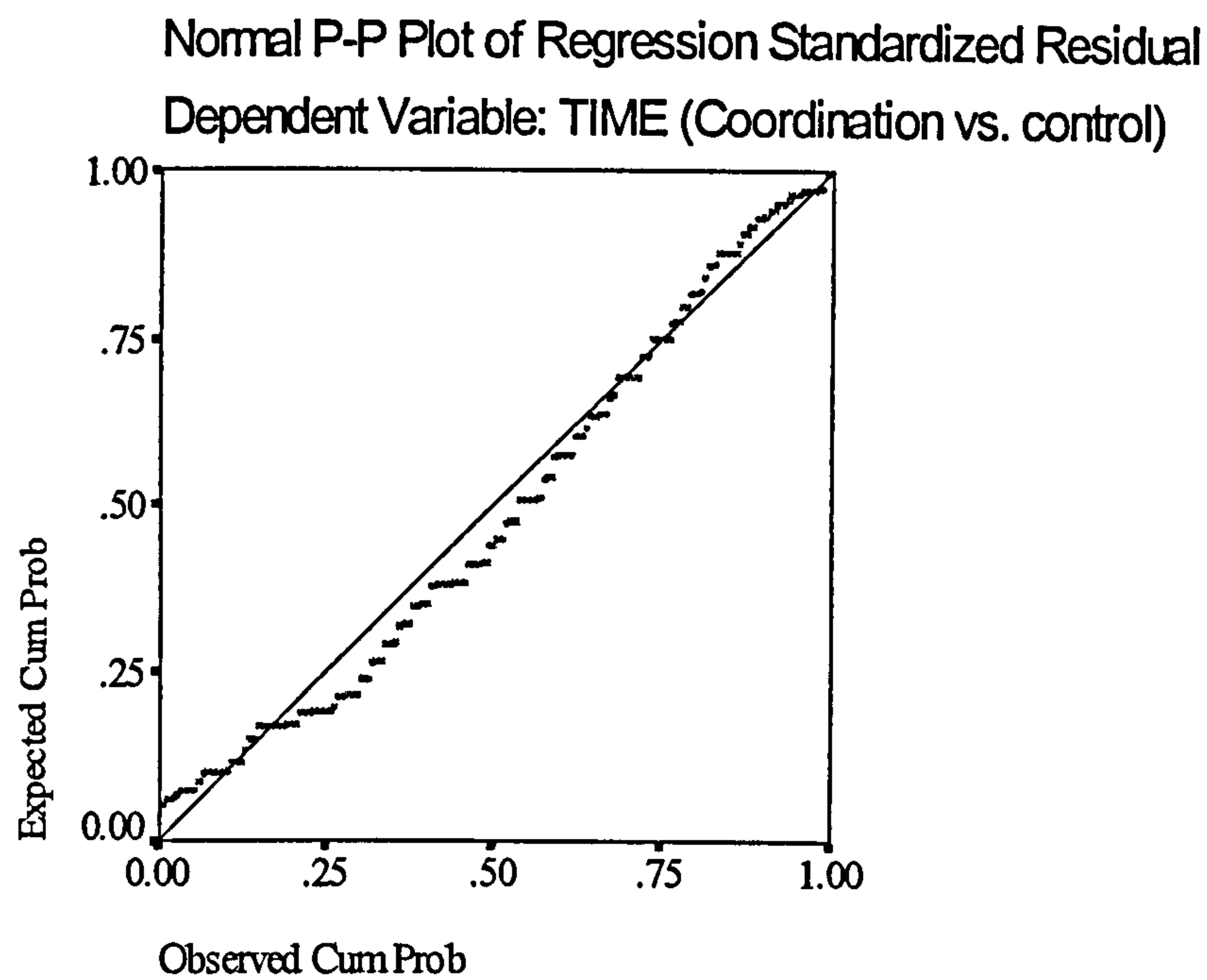


Figure C.22 Normal probability plot for Equation 2 (TIME)

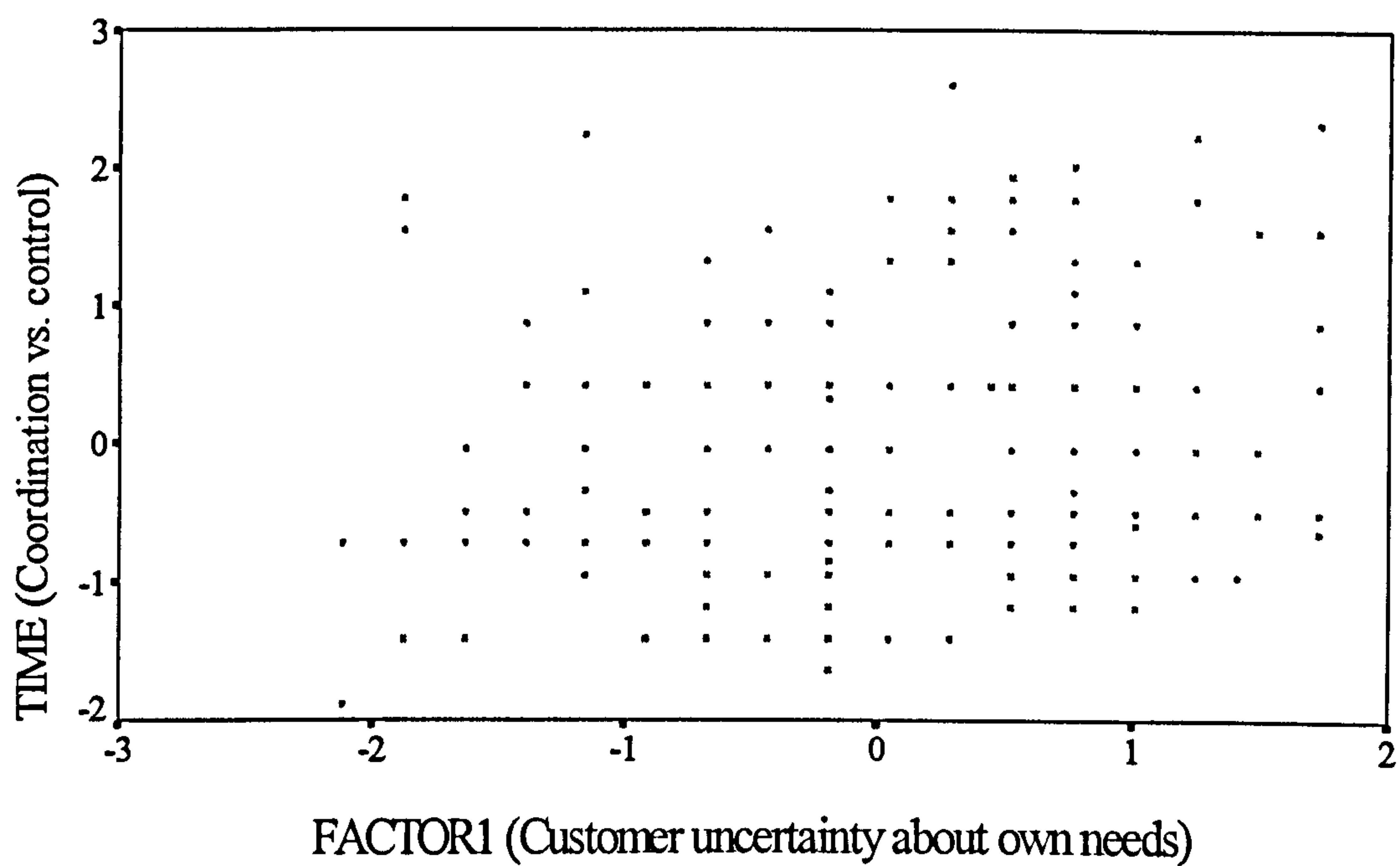


Figure C.23 Partial residual plot of FACTOR1 and TIME

The examination of Figures C.20 to C.23 provide assurance of the data meeting the assumptions of multiple regression analysis.

Influential observations

The application of the diagnostic measures shown in Table C.1, did not identify any observations as consistently influential across the whole set of measures. The analysis showed five observations that are relatively more frequently designated as influential observations. The multiple regression analysis was performed after omitting these five observations and the results obtained are illustrated below:

Dependent variable	Hypothesised influences (significant)	Estimated coefficients (standardised)	P value	R ²	R ² adj
TIME	FACTOR3	$\beta_{21} = 0.30$	0.0000	0.090	0.088

Table C.4 Results of multiple regression analysis for TIME after omitting influential observations

As illustrated in Table A.4, the model estimated after the influential cases are eliminated does not differ from the original model in terms of significant influences and levels of significance. The change in the value of R² adj, from 0.096 in the original sample to 0.088, is very small. A case-by-case examination of the influential observations does not reveal any theoretical reasons on which their final exclusion from the study could be based. Given that removing some influential outliers does not result into the strengthening of relationships the decision to retain the original model is reached in order to enhance generalisability of the results.

DEPENDENT VARIABLE : DE_PLCY3

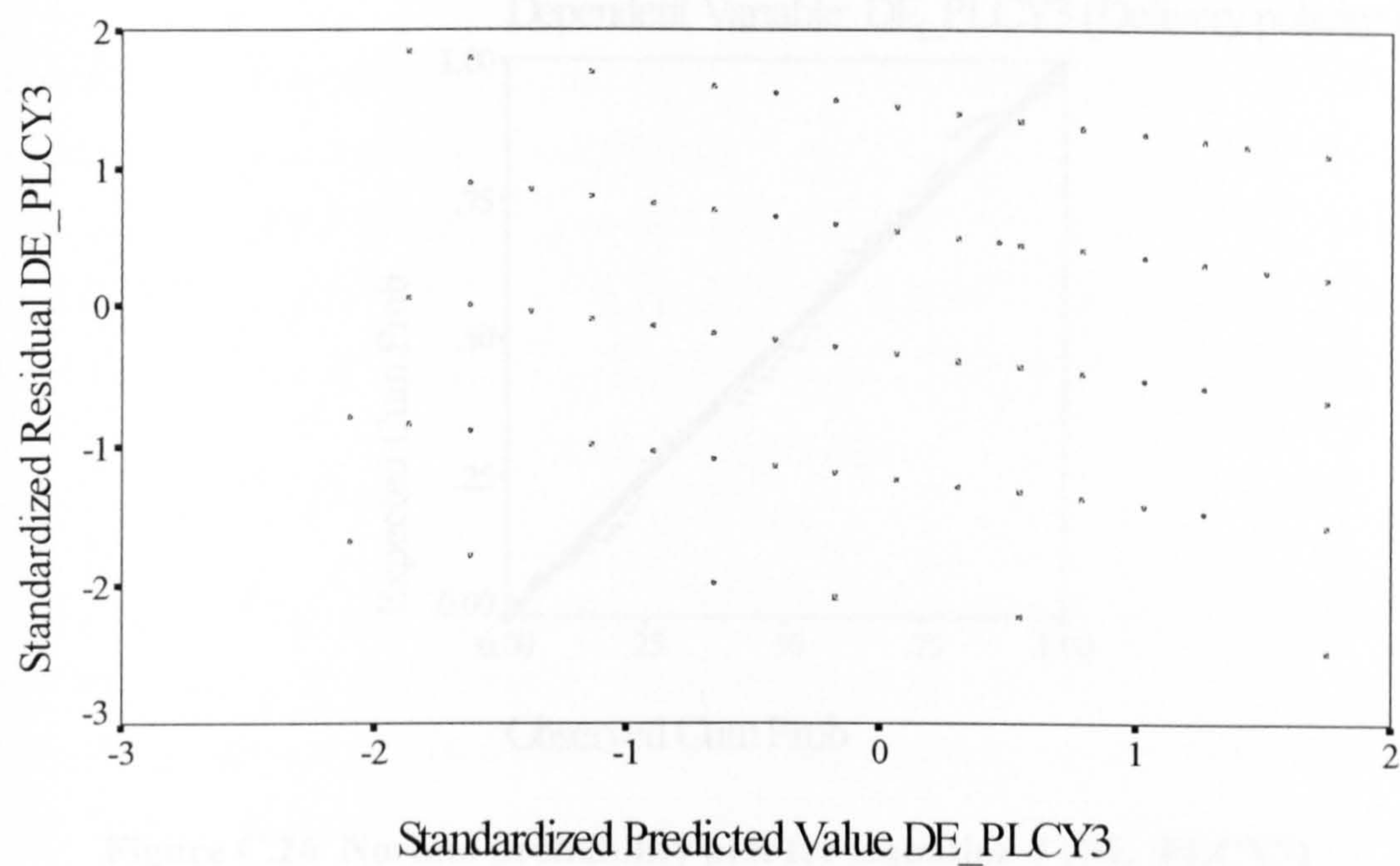


Figure C.24 Residuals plot for Equation 3 (DE_PLCY3)

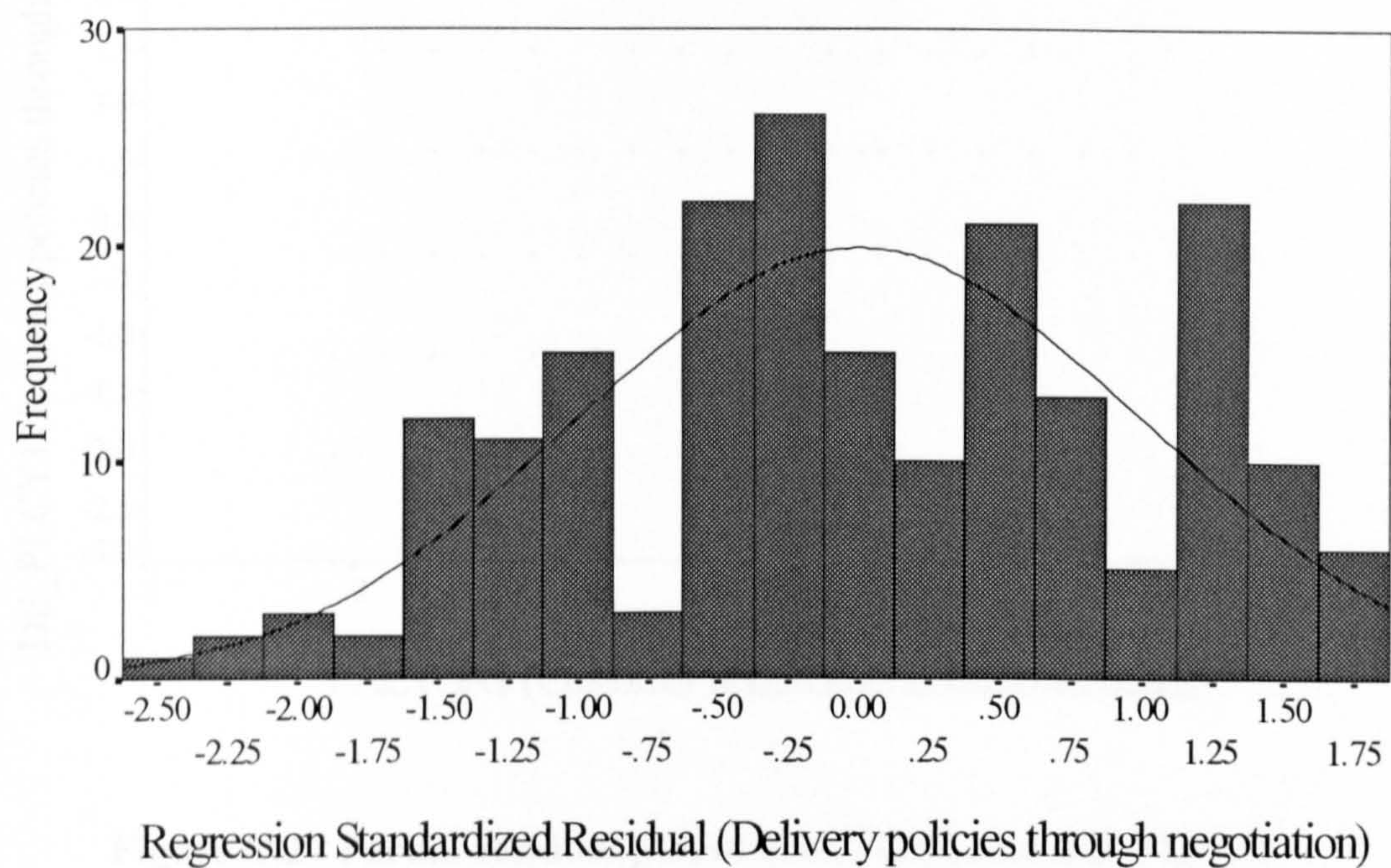


Figure C.25 Histogram of residuals for Equation 3 (DE_PLCY3)

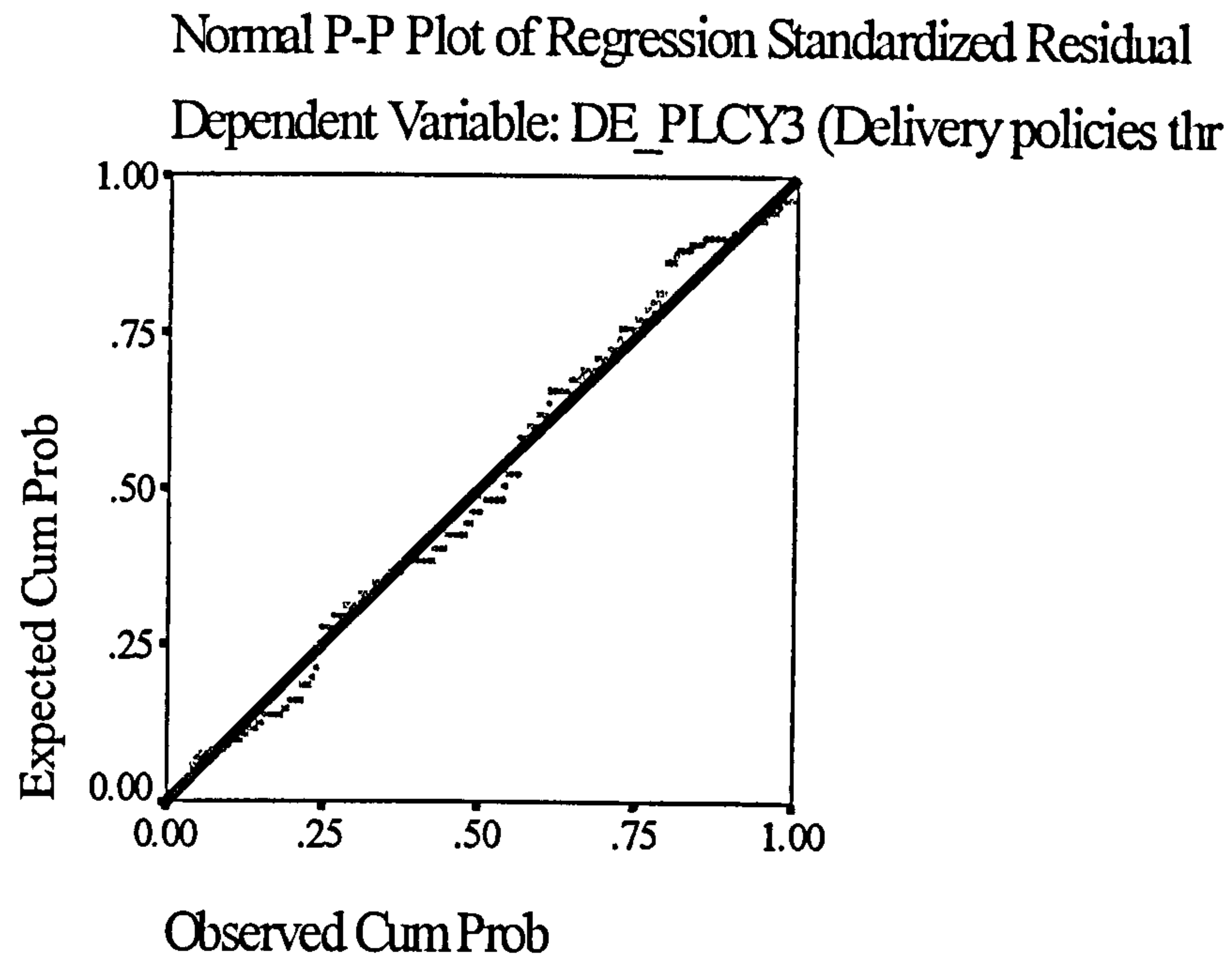


Figure C.26 Normal probability plot for Equation 3 (DE_PLCY3)

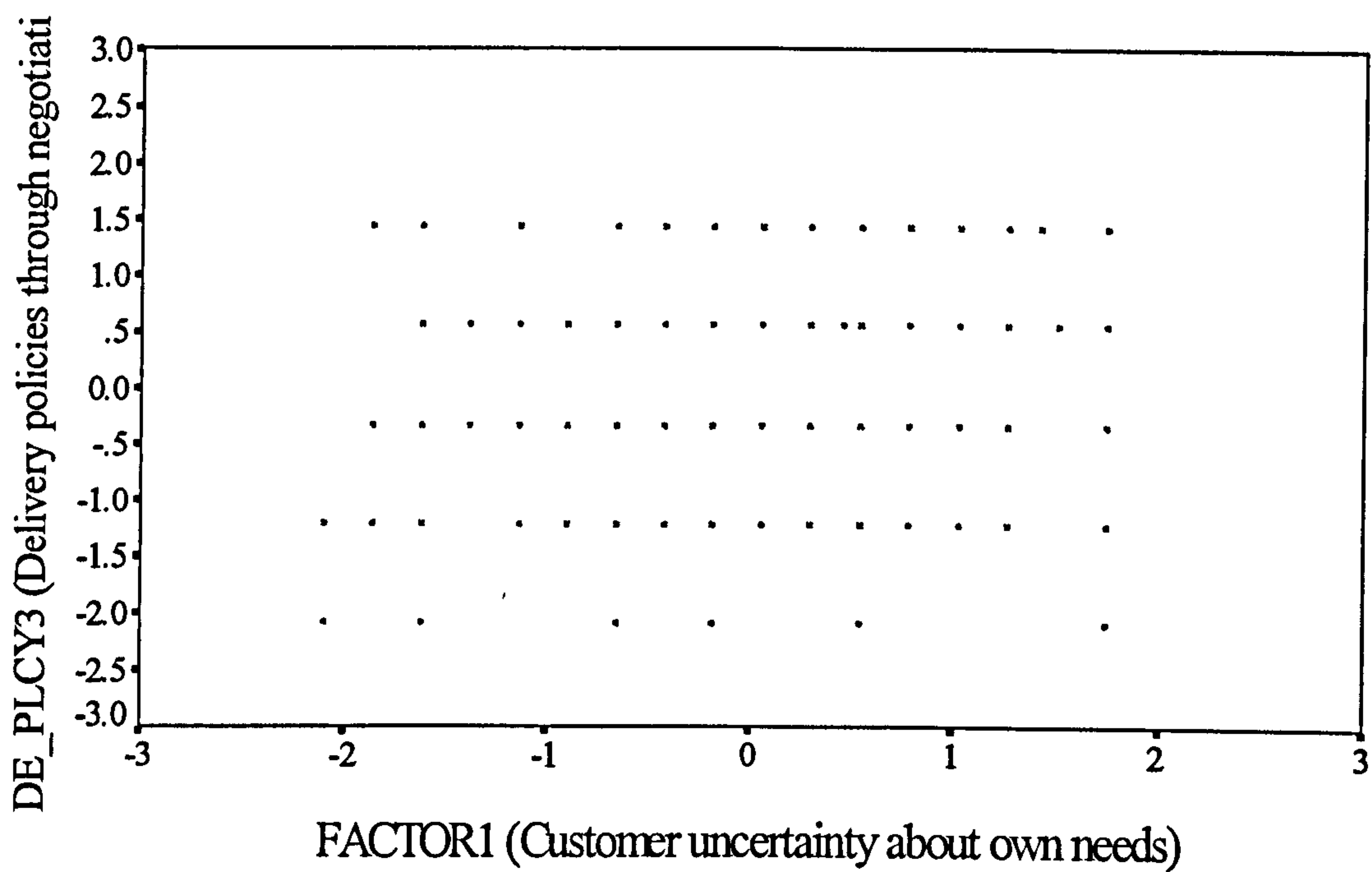


Figure C.27 Partial residual plot of FACTOR1 and DE_PLCY3

Influential observations

The application of the diagnostic measures shown in Table C.1 led to the identification of eight cases as comparatively influential observations. Model

estimation for DE_PLCY3 after omitting these eight variables gave the following results:

Dependent variable	Hypothesised influences (significant)	Estimated coefficients (standardised)	P value	R ²	R ² adj
DE_PLCY3	FACTOR1	$\beta_{31} = -0.27$	0.0001	0.070	0.06

Table C.5 Results of mulitple regression analysis for DE_PLCY3 after omitting influential observations

As shown in Table C.5, the omission of these variables marginally improves the R² adj from 0.035 to 0.06. A case-by-case examination of the influential observations does not reveal any theoretical reasons on which their final exclusion from the study could be based. Given that removing some influential observations does not result into the inclusion of additional predictors in the model or a substantial increase in the explanatory power of the model, the decision to retain the original model is reached in order to enhance generalisability of the results.

DEPENDENT VARIABLE : SCHEDULE

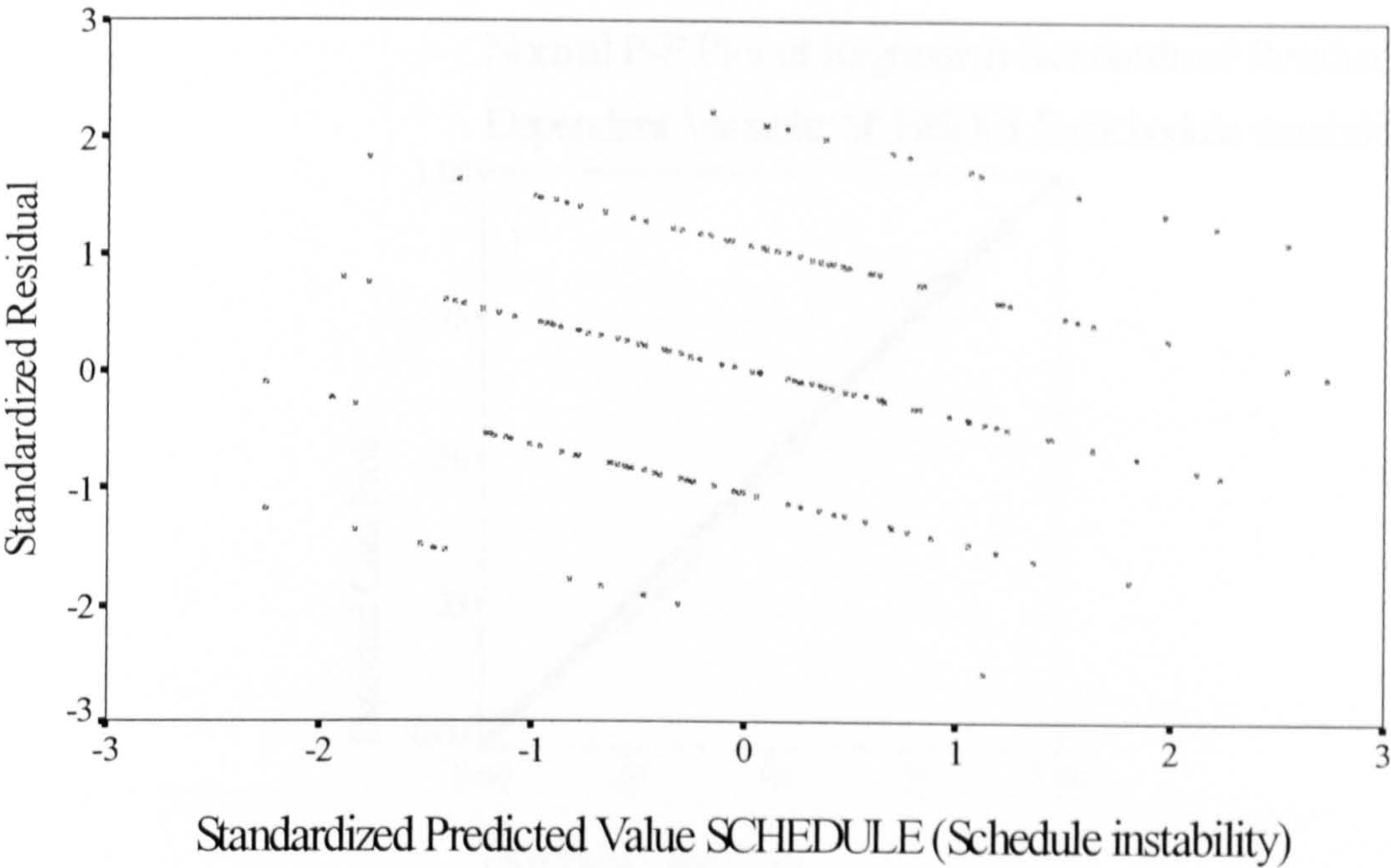


Figure C.28 Residuals plot for Equation 4 (SCHEDULE)

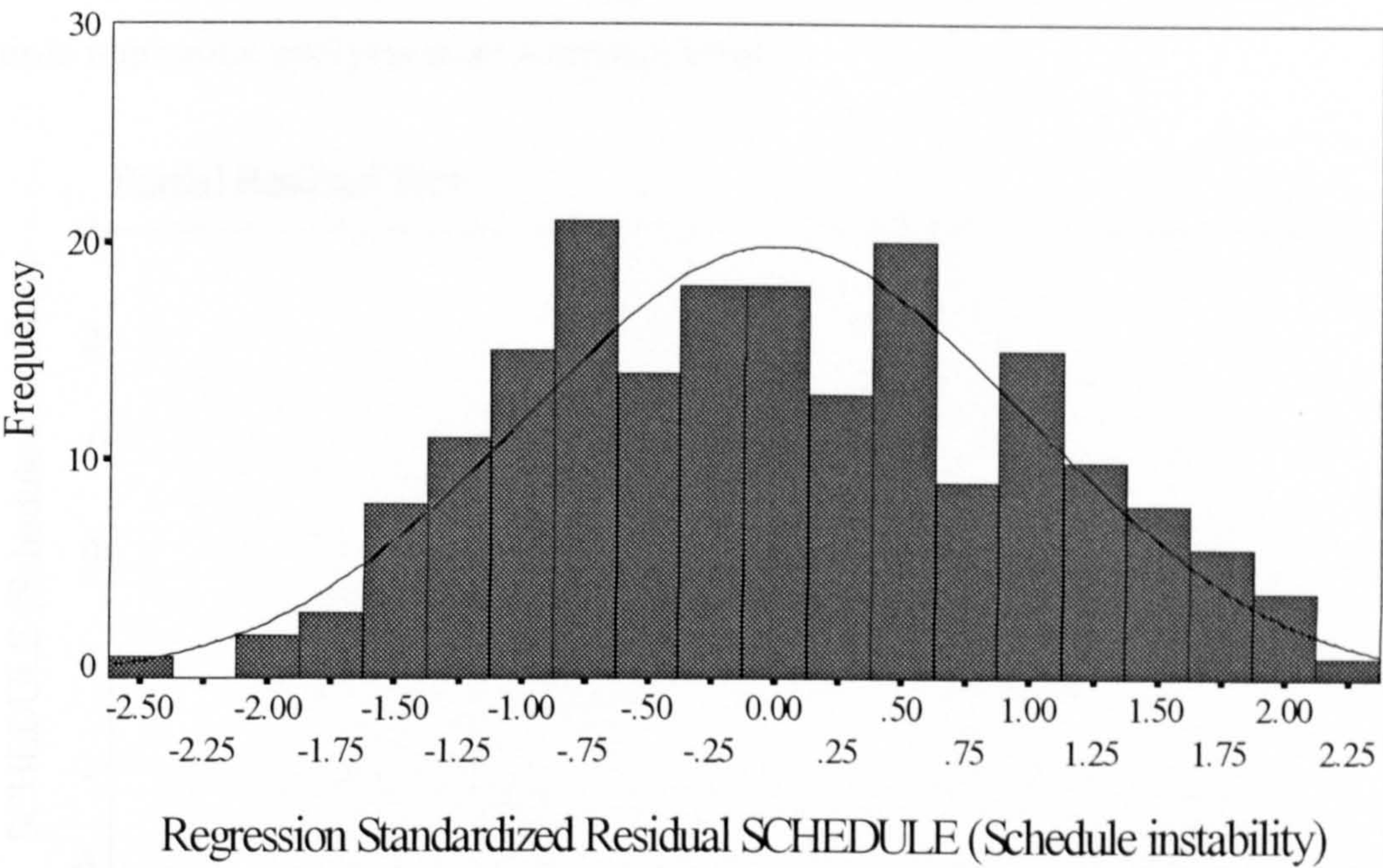


Figure C.29 Histogram of residuals for Equation 4 (SCHEDULE)

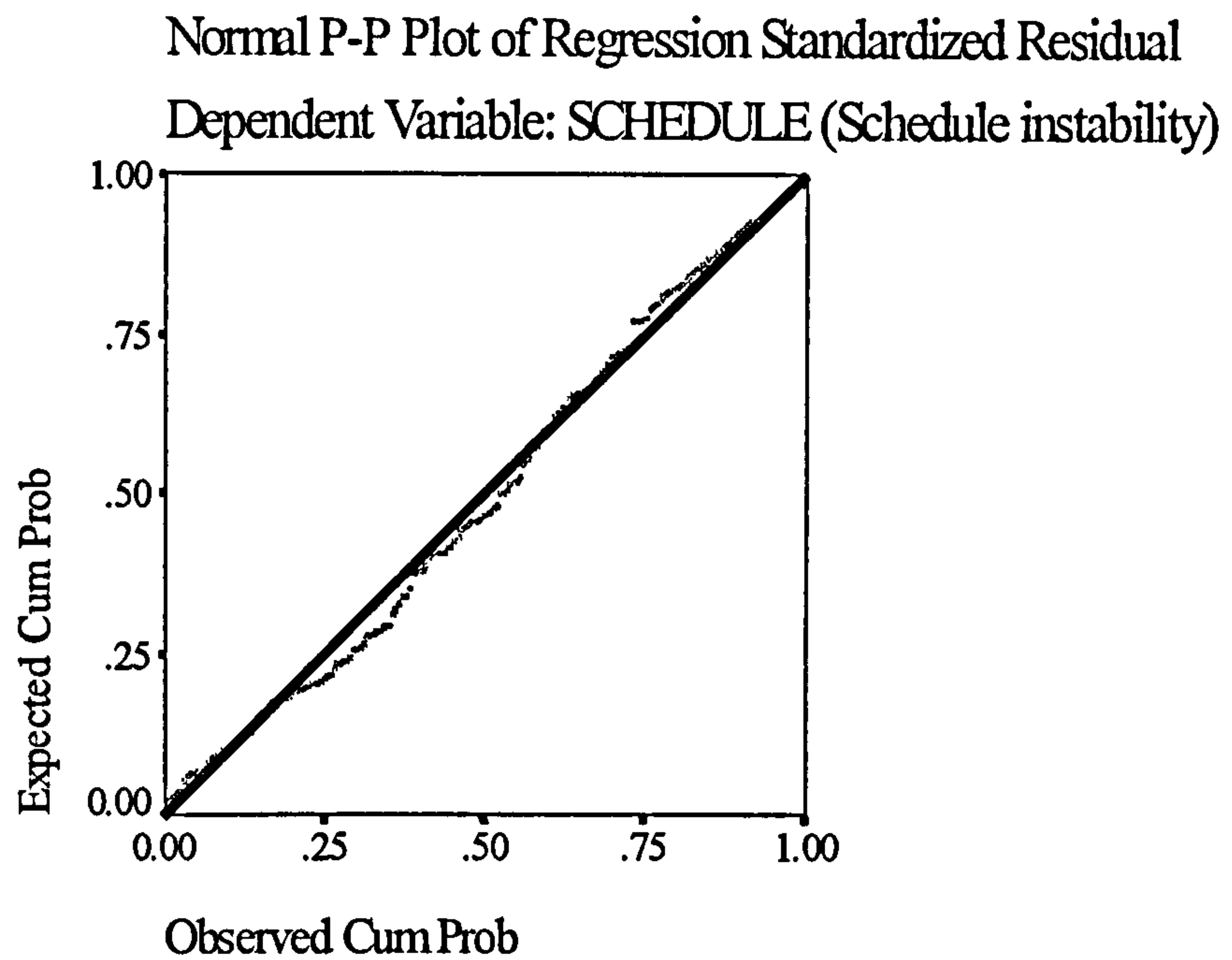


Figure C.30 Normal probability plot for SCHEDULE

Figures C.28 to C.30 indicate that the regression variate meets the assumptions of multiple regression analysis at an adequate level.

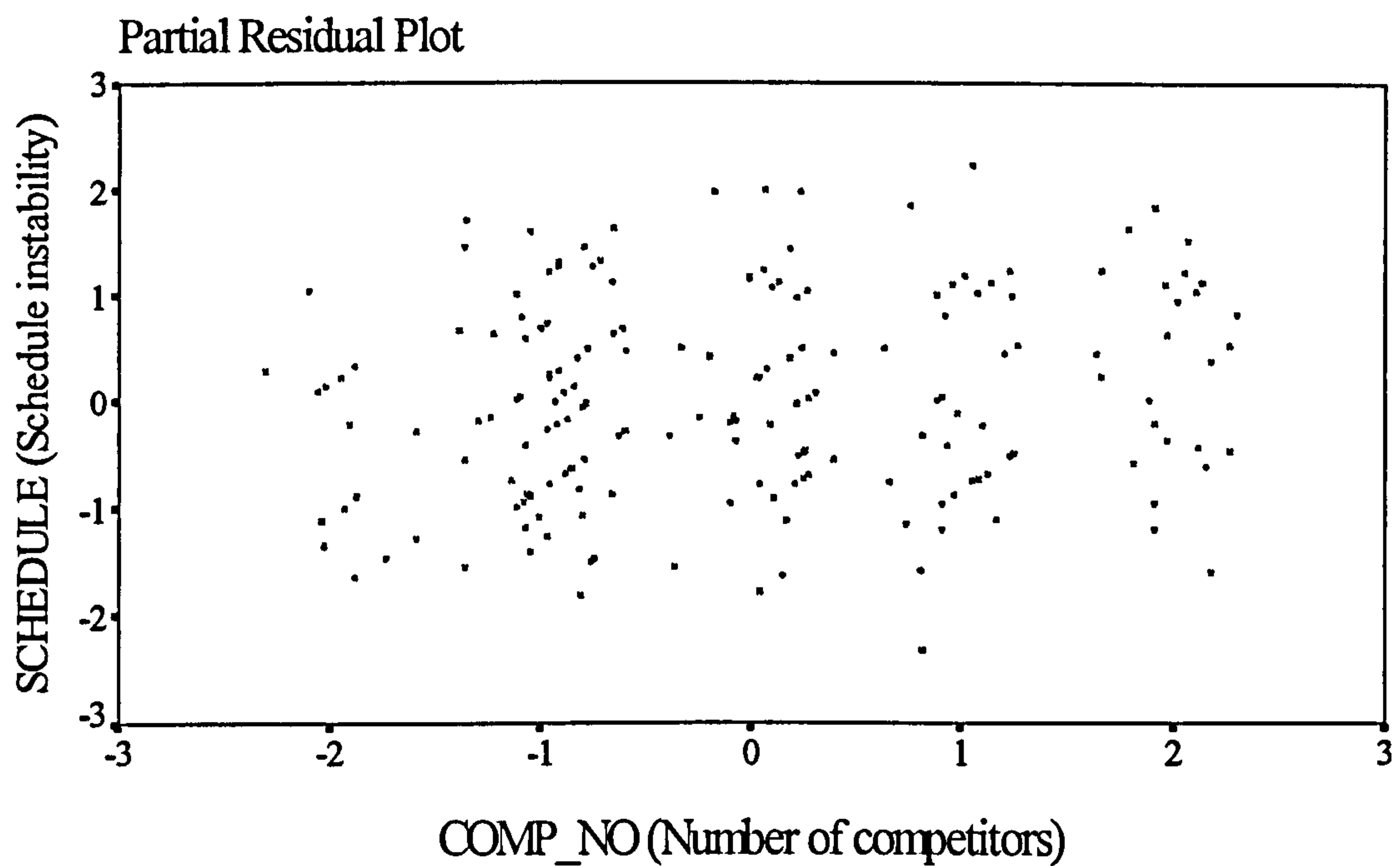


Figure C.31 Partial residual plot of COMP_NO and SCHEDULE

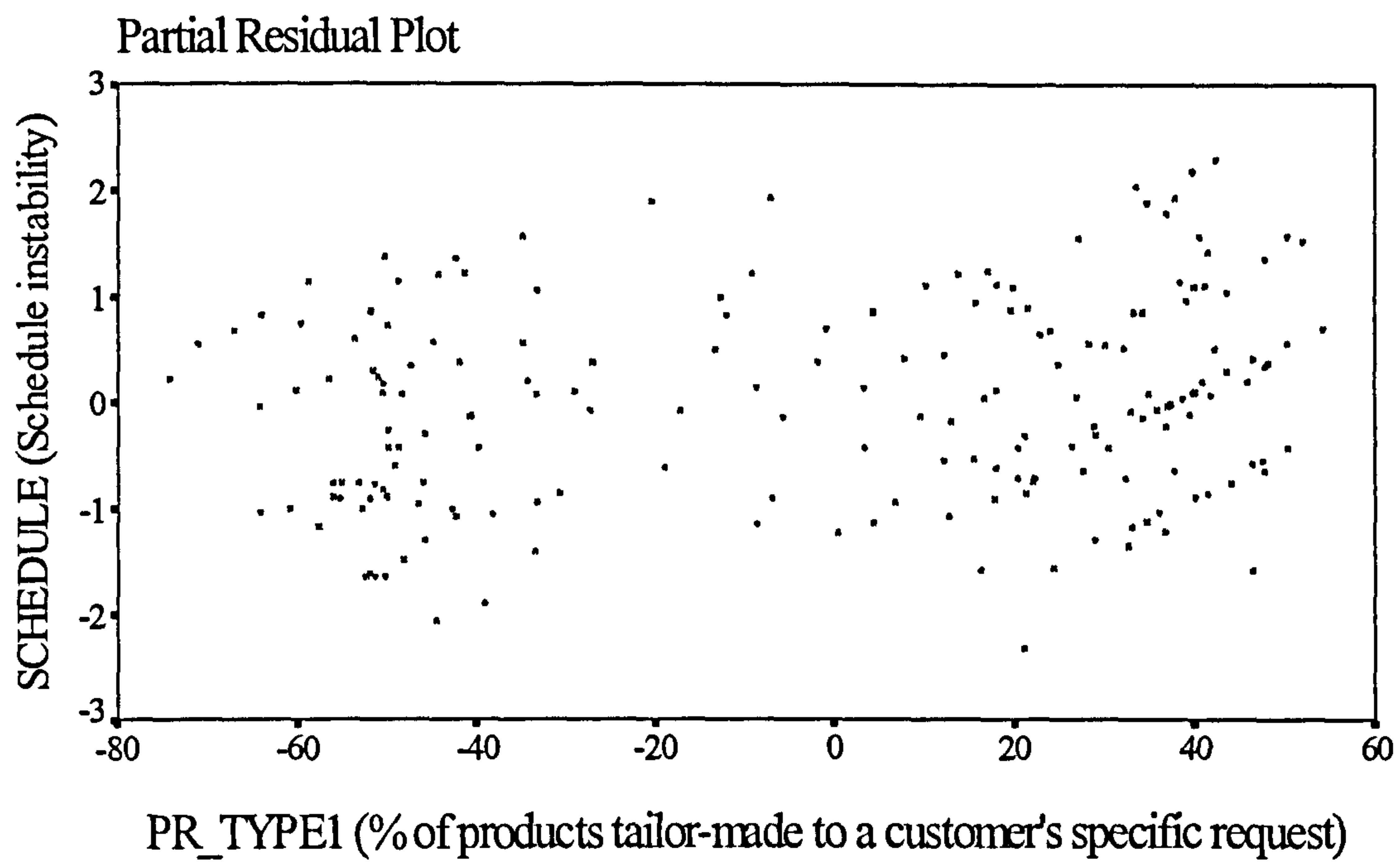


Figure C.32 Partial residual plot of PR_TYPE1 and SCHEDULE

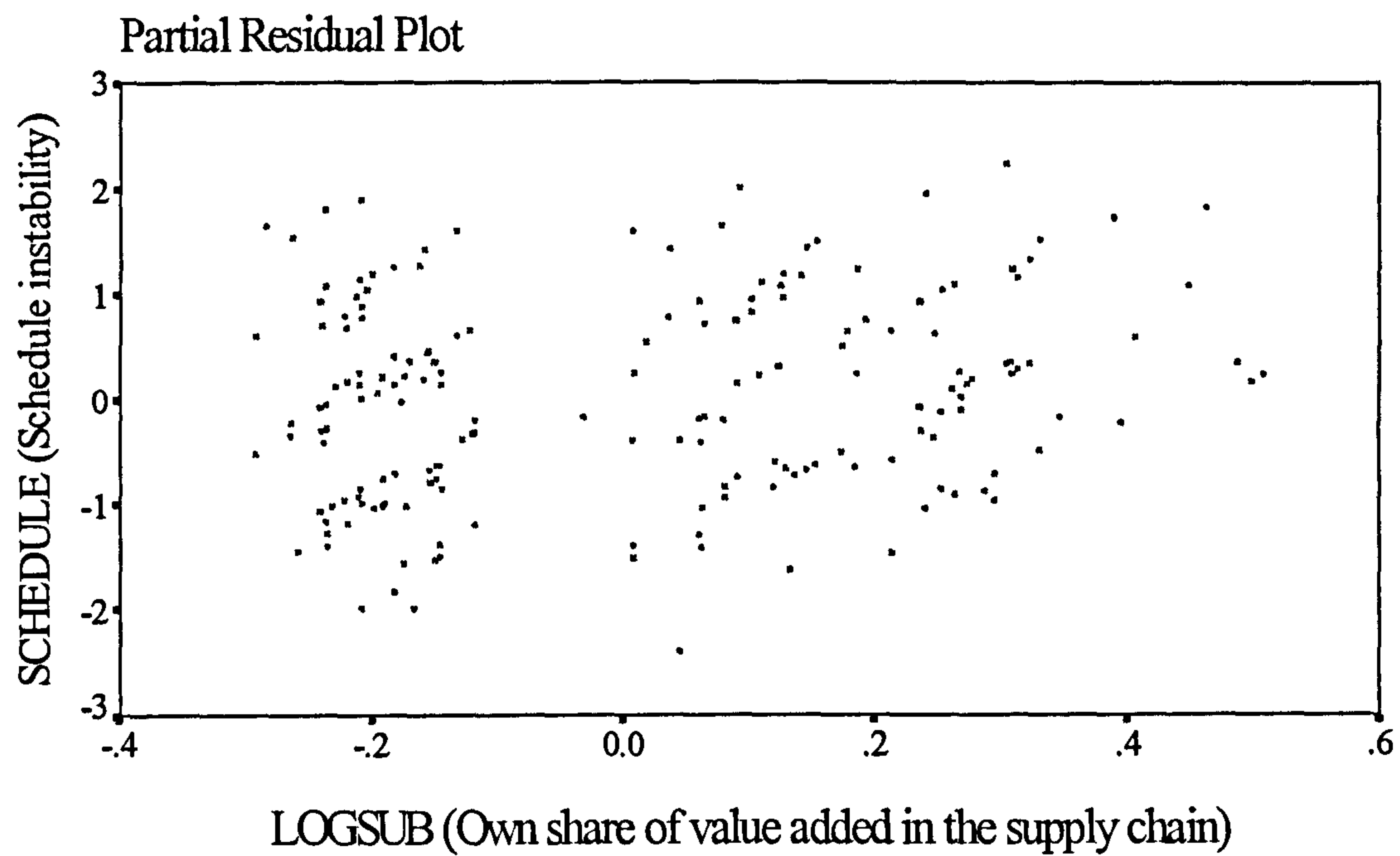


Figure C.33 Partial residual plot of LOGSUB and SCHEDULE

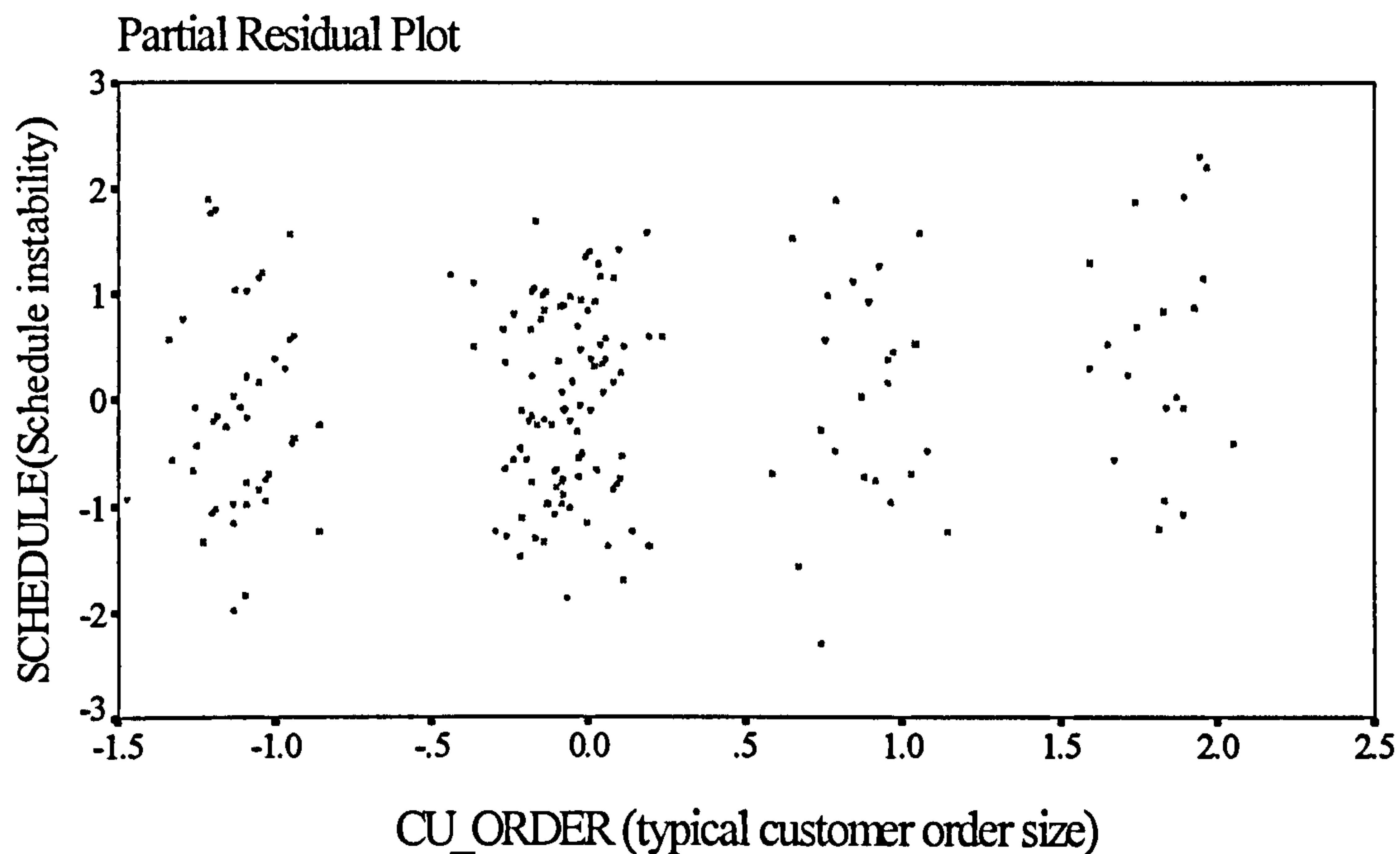


Figure C.34 Partial residual plot of CU_ORDER and SCHEDULE

Figures C.31 to C.34 do not indicate any nonlinear patterns in the relationships of the dependent variable with the individual independent variables.

Influential observations

The application of the diagnostic measures shown in Table C.1 led to the identification of seven cases as comparatively influential observations. Model estimation for SCHEDULE after omitting these seven variables gave the following results:

Dependent variable	Hypothesised influences (significant)	Estimated coefficients (standardised)	P value	R ²	R ² adj
SCHEDULE	CU_ORDER	$\beta_{45} = 0.15$	0.0204	0.179	0.162
	PR_TYPE1	$\beta_{48} = 0.16$	0.0186		
	COMP_NO	$\beta_{49} = 0.18$	0.0085		
	SUB	$\beta_{43} = 0.23$	0.0007		

Table C.6 Results of multiple regression analysis for SCHEDULE after omitting influential observations

As illustrated in Table C.6, the model estimated after the influential cases are eliminated does not differ from the original model in terms of significant influences and levels of significance. The change in the value of R² adj, from 0.130 in the original sample to 0.162, is fairly small. A case-by-case examination of the influential observations does not reveal any theoretical reasons on which their final exclusion from the study could be based. Given that removing some influential observations does not result in a drastic strengthening of relationships the decision to retain the original model is reached in order to enhance generalisability of the results.

DEPENDENT VARIABLE: CUST_NO

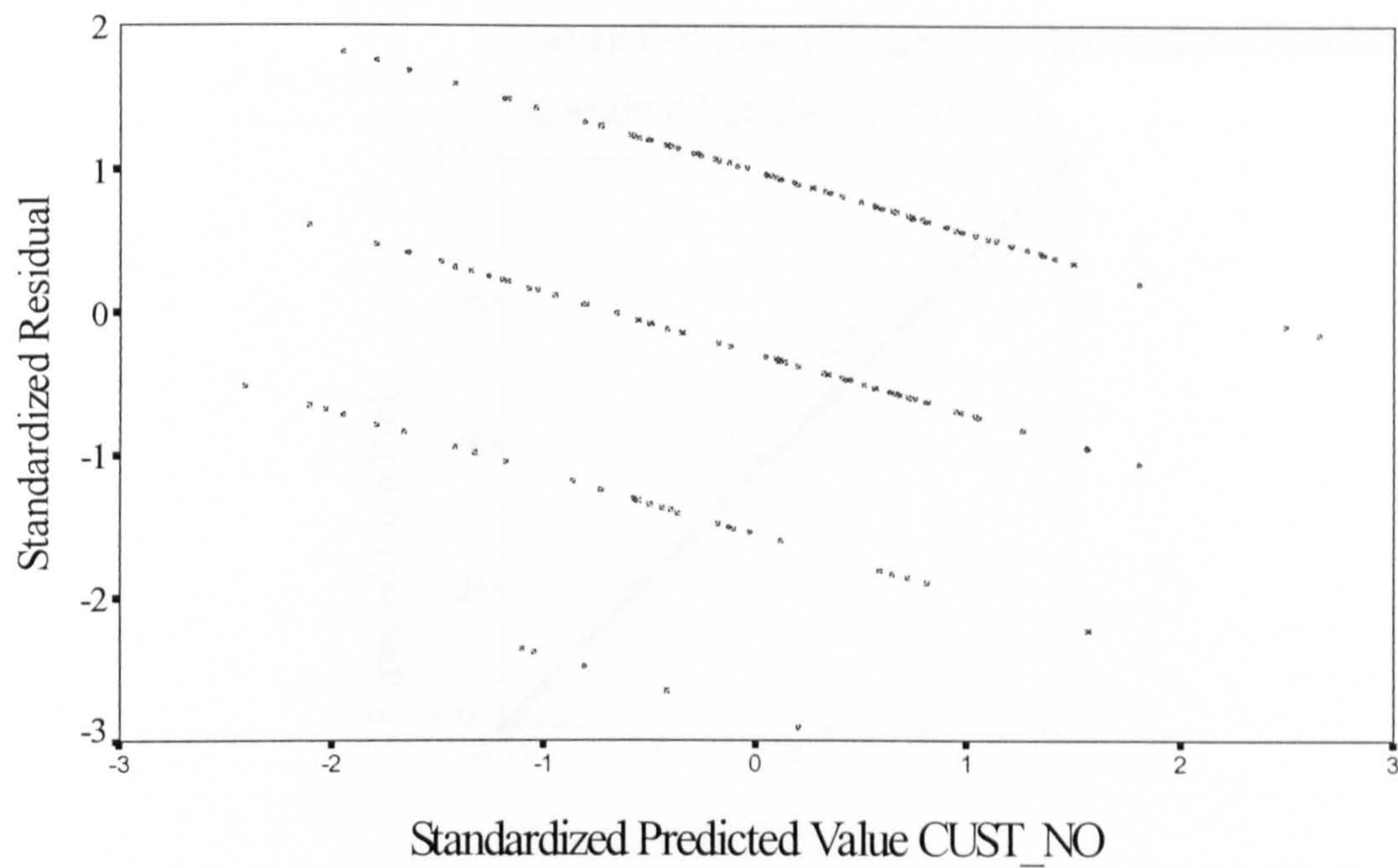


Figure C.35 Residuals plot for Equation 6 (CUST_NO)

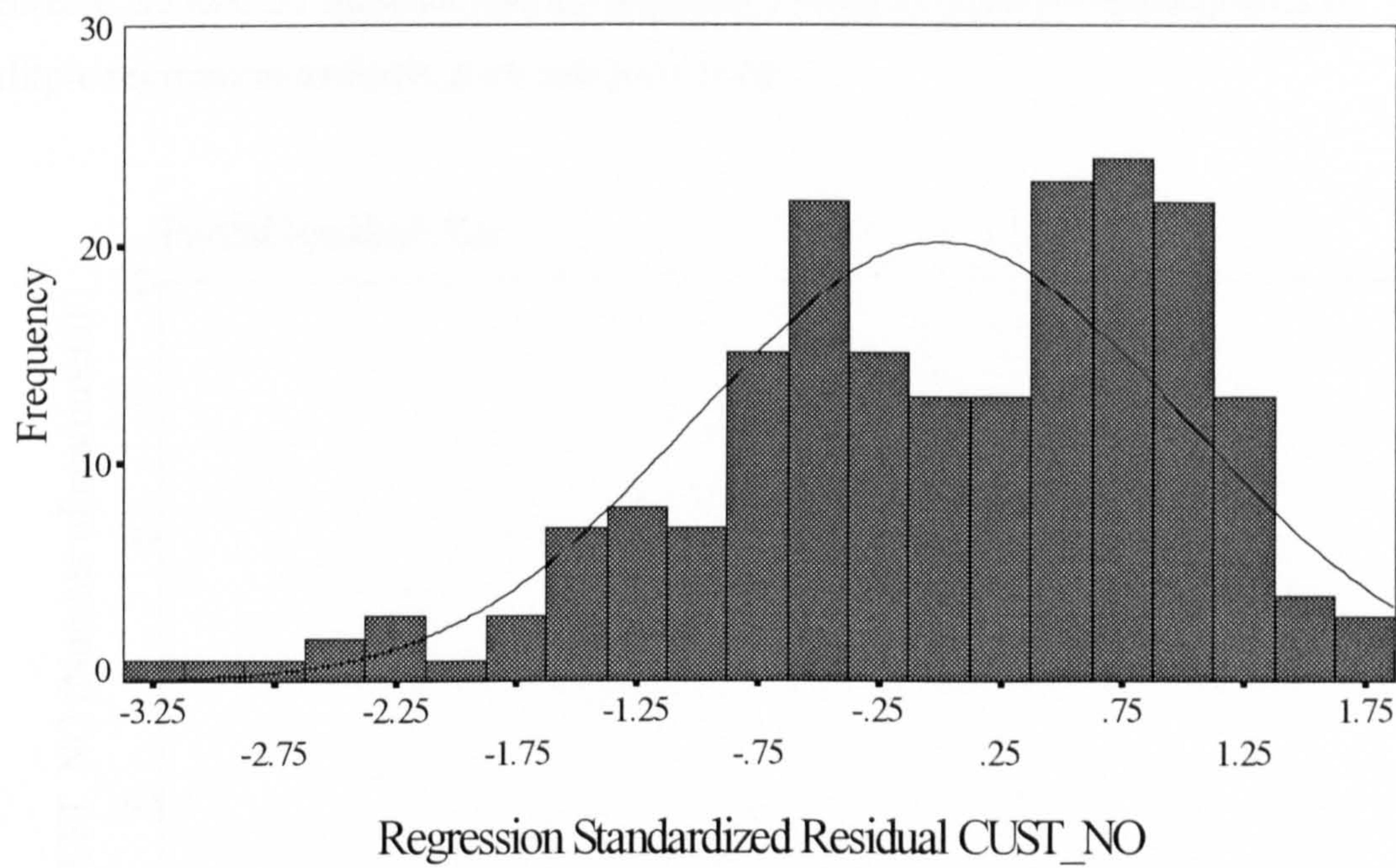


Figure C.36 Histogram of residuals for Equation 6 (CUST_NO)

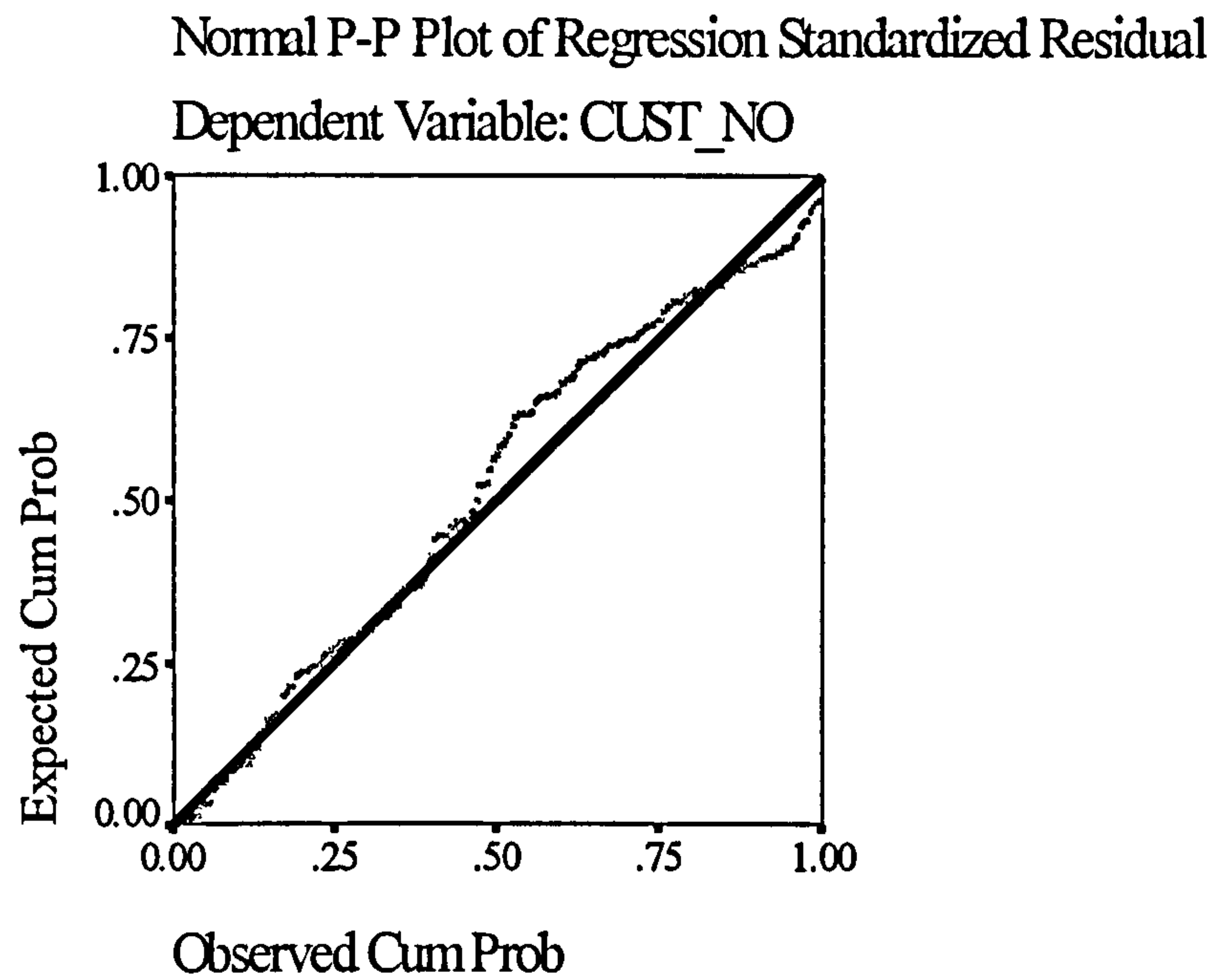


Figure C.37 Normal Probability plot for Equation 6 (CUST_NO)

Figures C.35 to C.37 indicate that the regression variate meets the assumptions of multiple regression analysis at an adequate level.

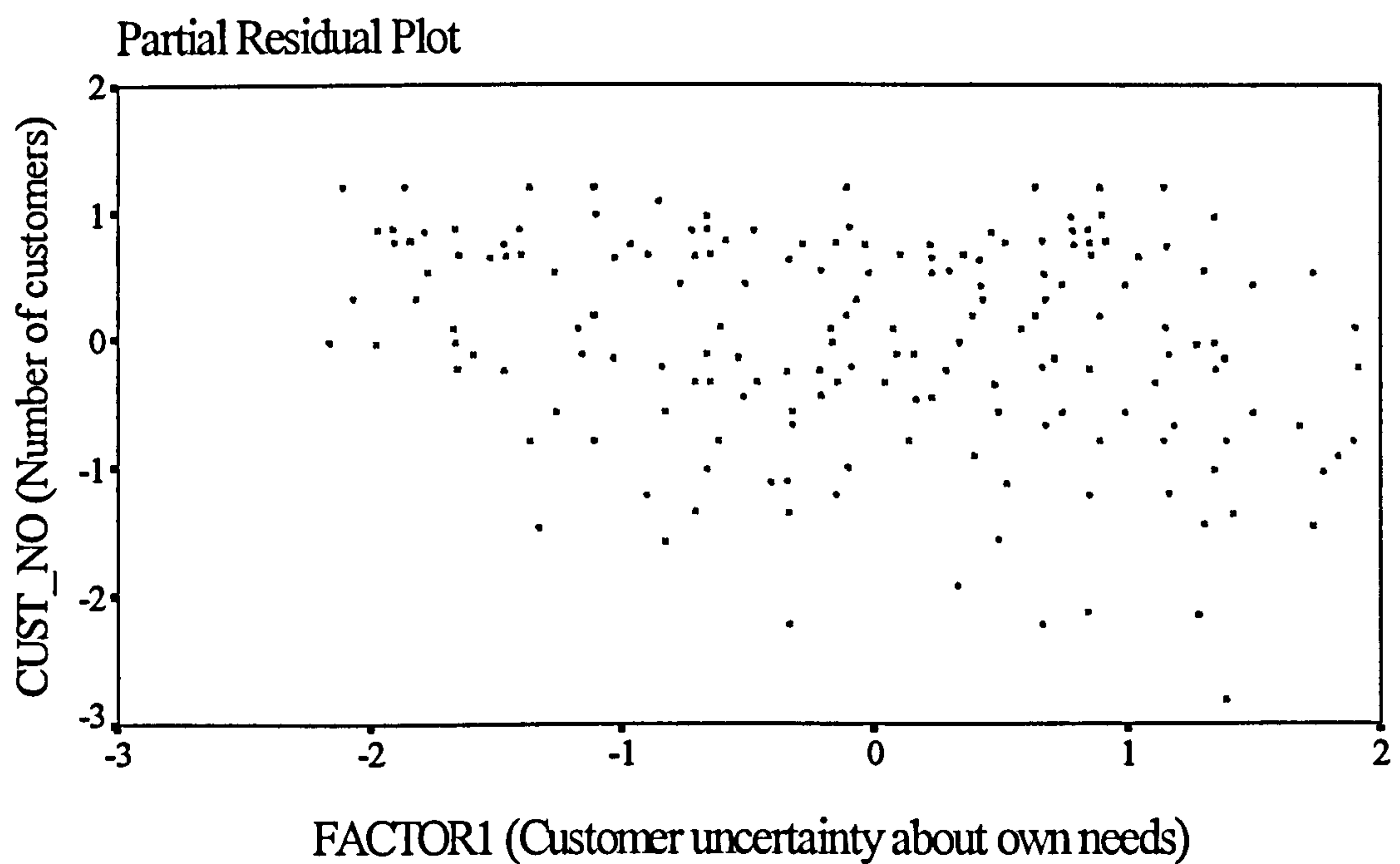


Figure C.38 Partial residual plot of FACTOR1 and CUST_NO

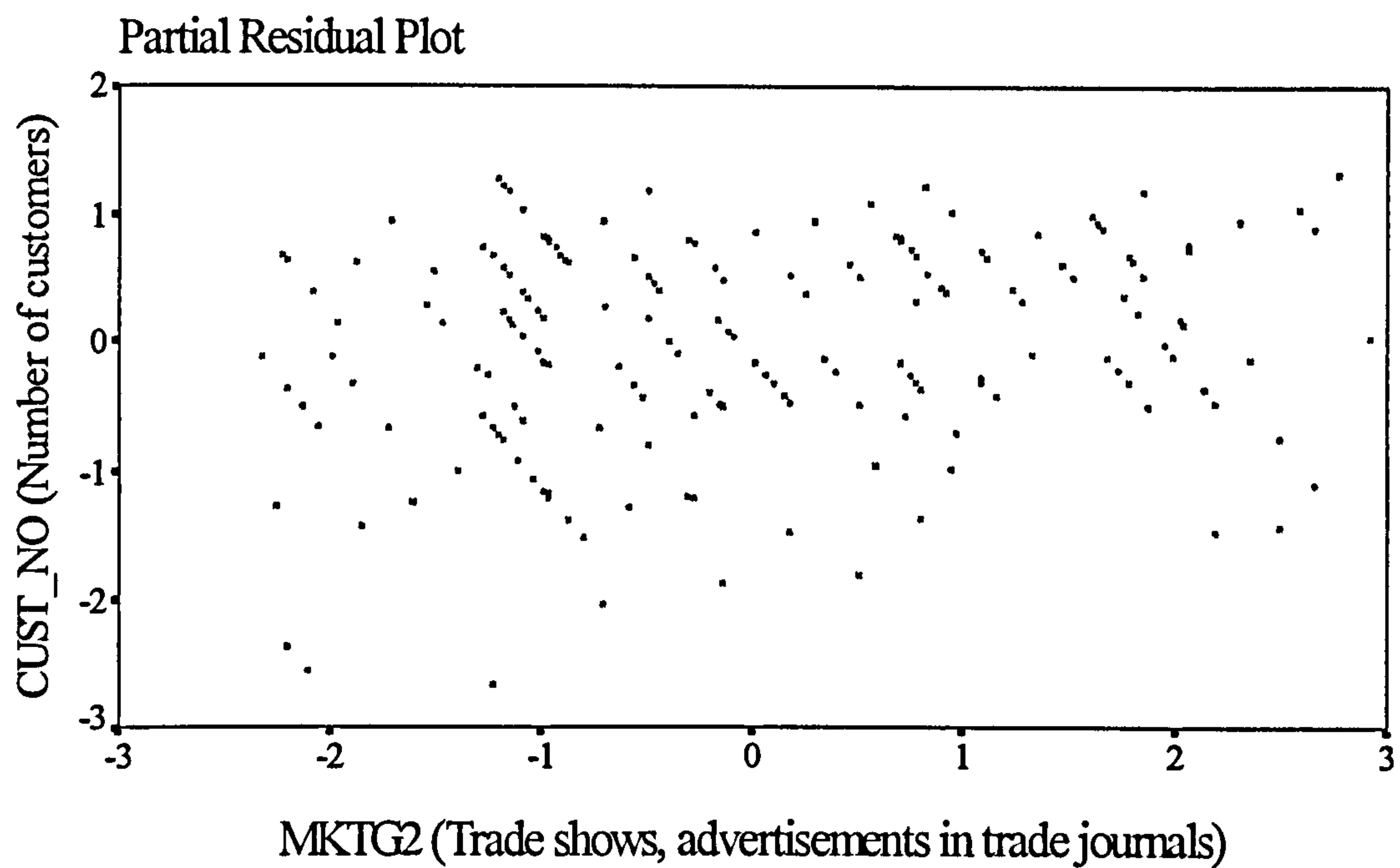


Figure C.39 Partial residual plot of MKTG2 and CUST_NO

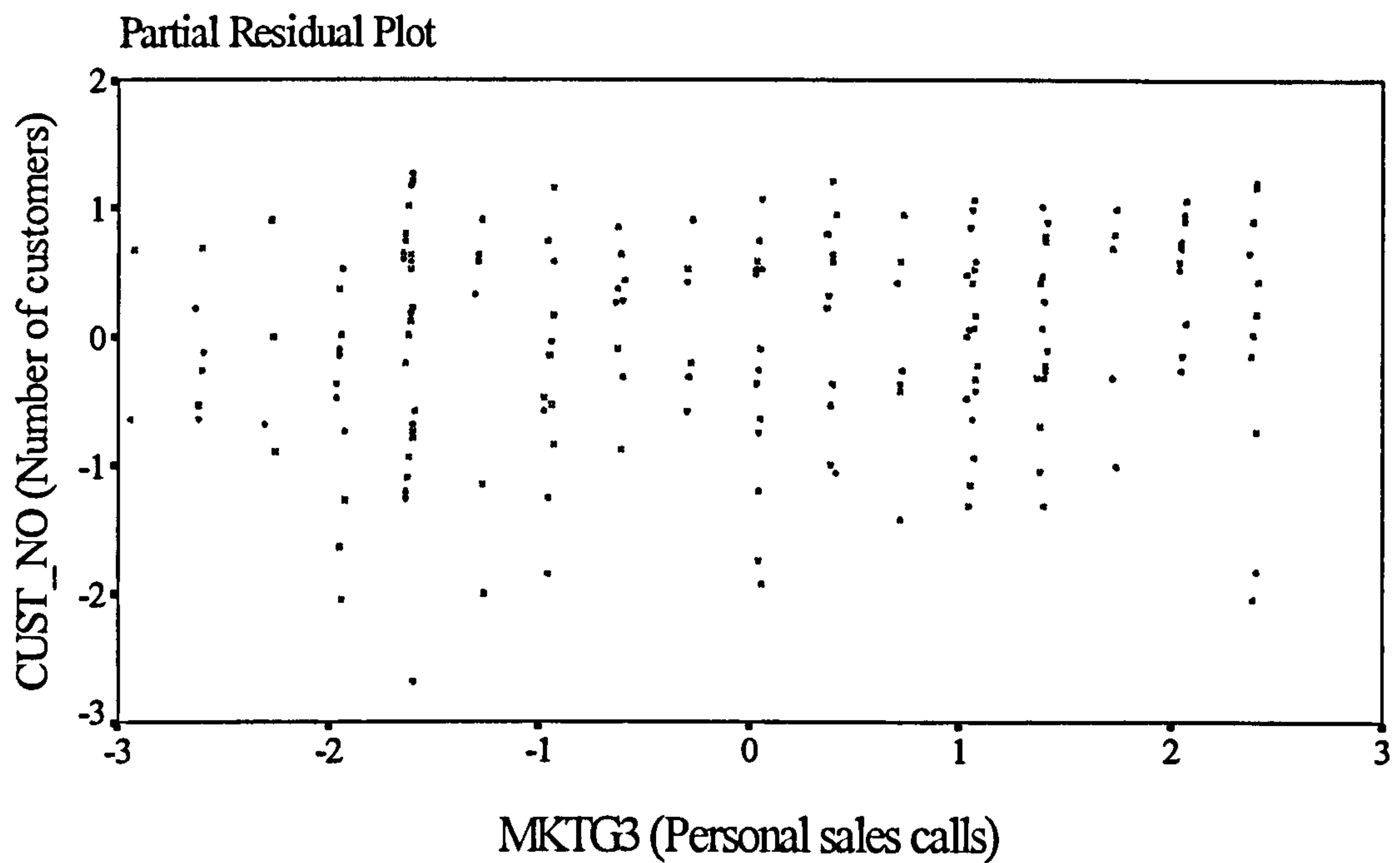


Figure C.40 Partial residual plot of MKTG3 and CUST_NO

Figures C.38 to C.40 do not indicate any nonlinear patterns in the relationships between the dependent variable and the individual independent variables.

Influential observations

The application of the diagnostic measures shown in Table C.1 led to the identification of eight cases as comparatively influential observations. Model estimation for SCHEDULE after omitting these eight cases gave the following results:

Dependent variable	Hypothesised influences (significant)	Estimated coefficients (standardised)	P value	R ²	R ² adj
CUST_NO	FACTOR1	$\beta_{61} = -0.25$	0.0002	0.167	0.154
	MKTG2	$\beta_{65} = 0.21$	0.0033		
	MKTG3	$\beta_{66} = 0.21$	0.0027		

Table C.7 Results of multiple regression analysis for SCHEDULE after omitting influential observations

As illustrated in Table C.7, the model estimated after the influential cases are eliminated does not differ from the original model in terms of significant influences and levels of significance. The improvement in the value of R² adj, from 0.145 in the original sample to 0.154, is extremely small. A case-by-case examination of the influential observations does not reveal any theoretical reasons on which their final exclusion from the study could be based. Given that removing some influential observations does not result in a drastic strengthening of relationships the decision to retain the original model is reached in order to enhance generalisability of the results.

DEPENDENT VARIABLE: SDEPNDNCE

The number of customers (CUST_NO) is the only independent variable used in explaining the level of dependence on customers (SDEPNDNCE).

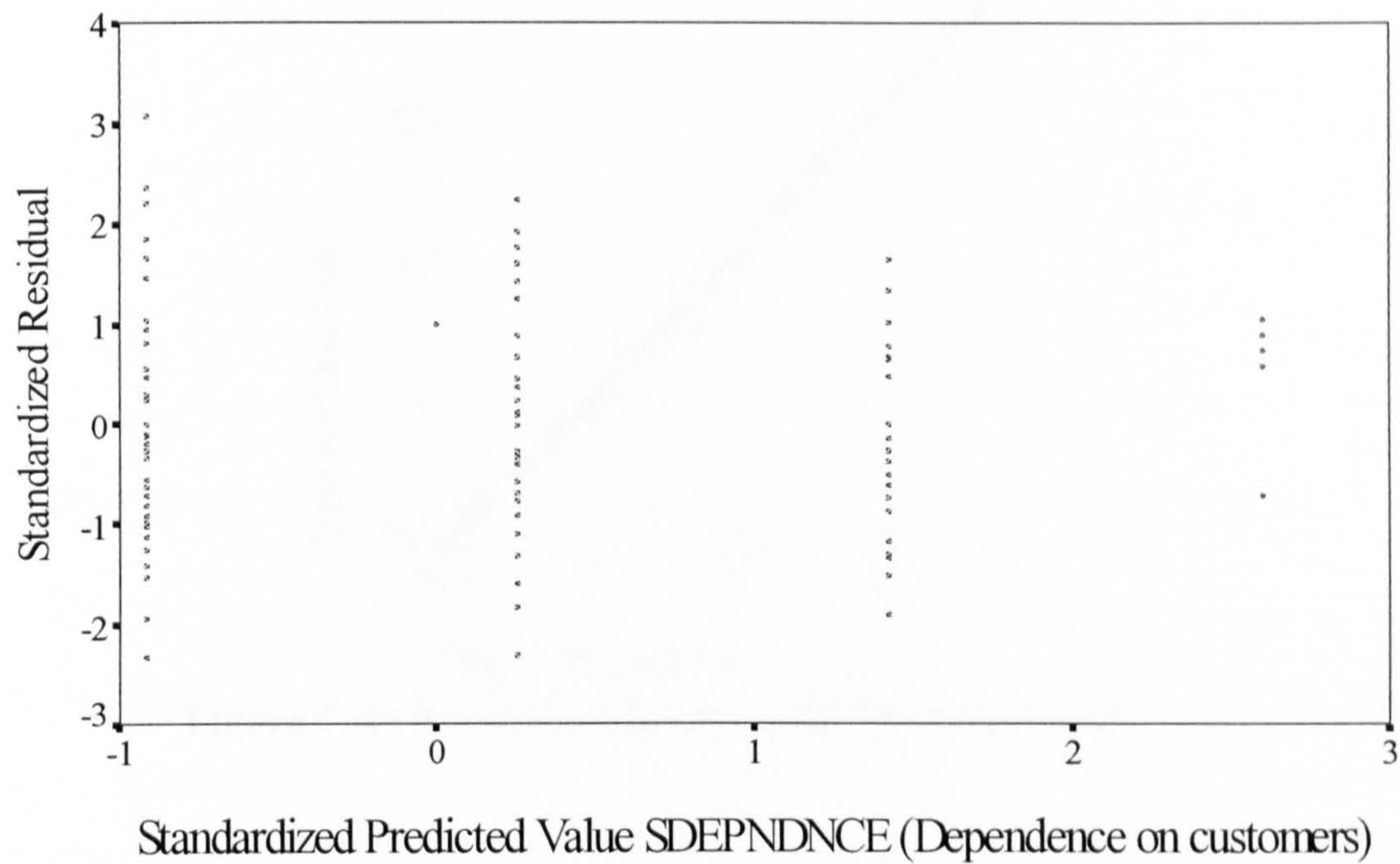


Figure C.41 Residuals plot for Equation 7

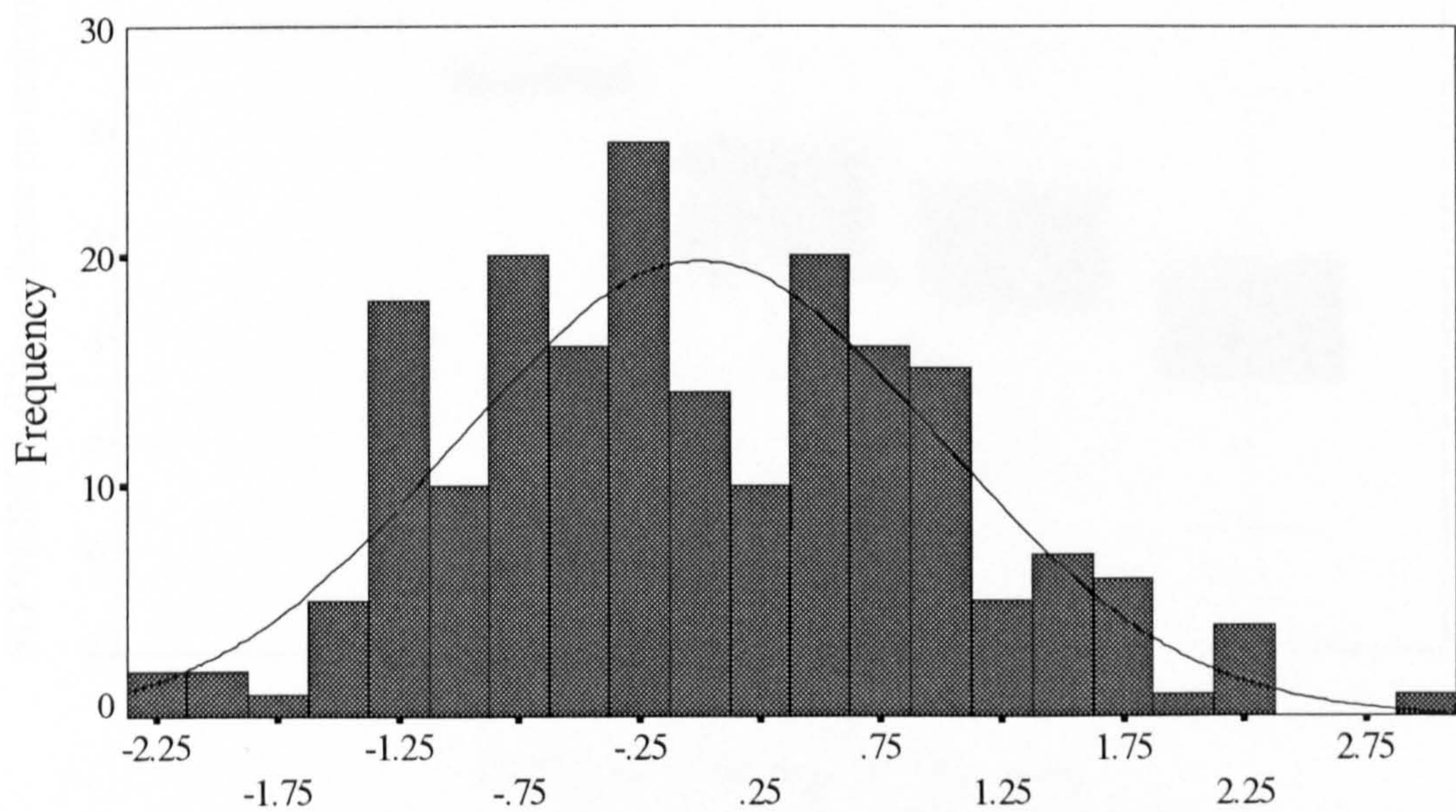


Figure C.42 Histogram of residuals for Equation 7

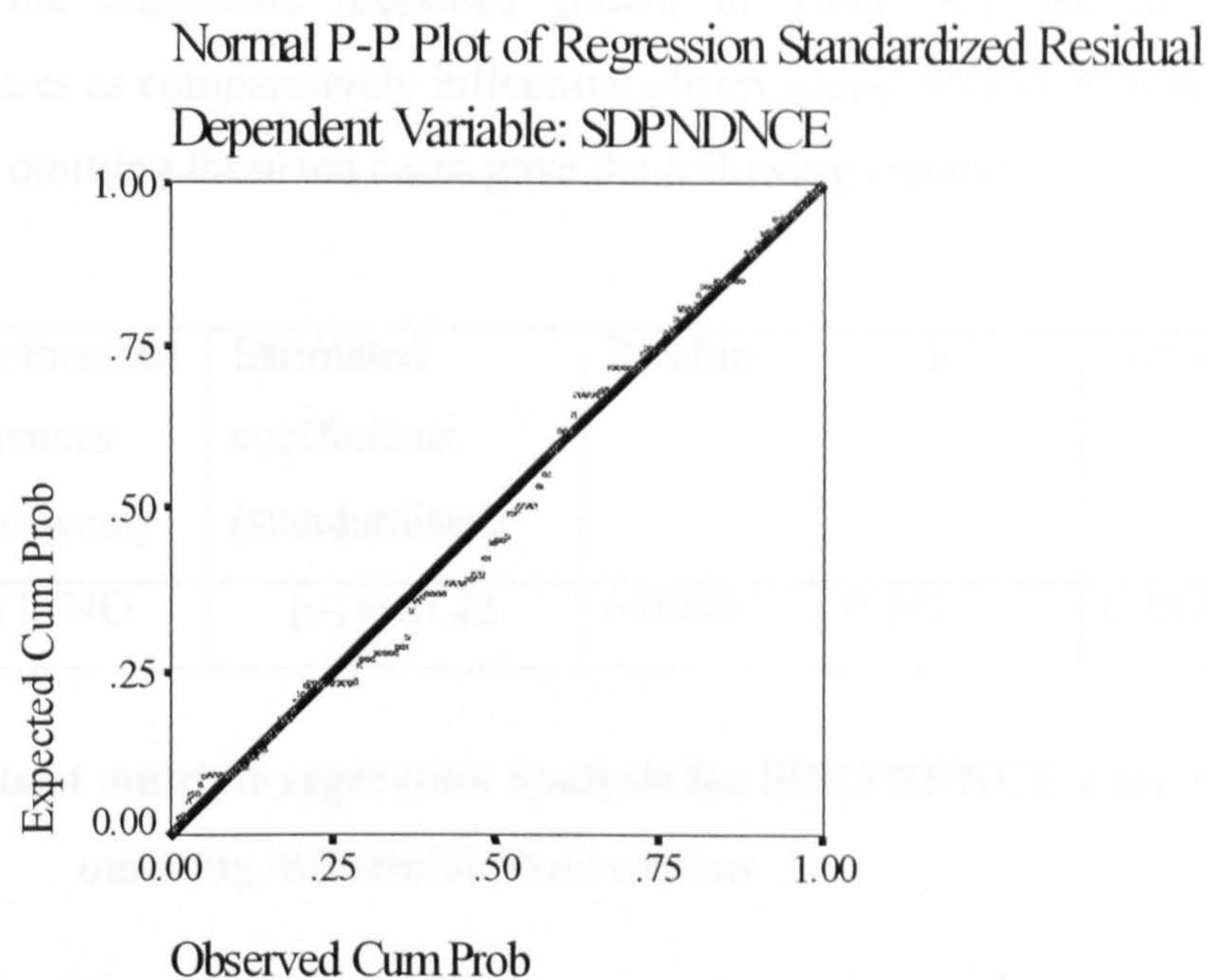


Figure C.43 Normal probability plot for Equation 7

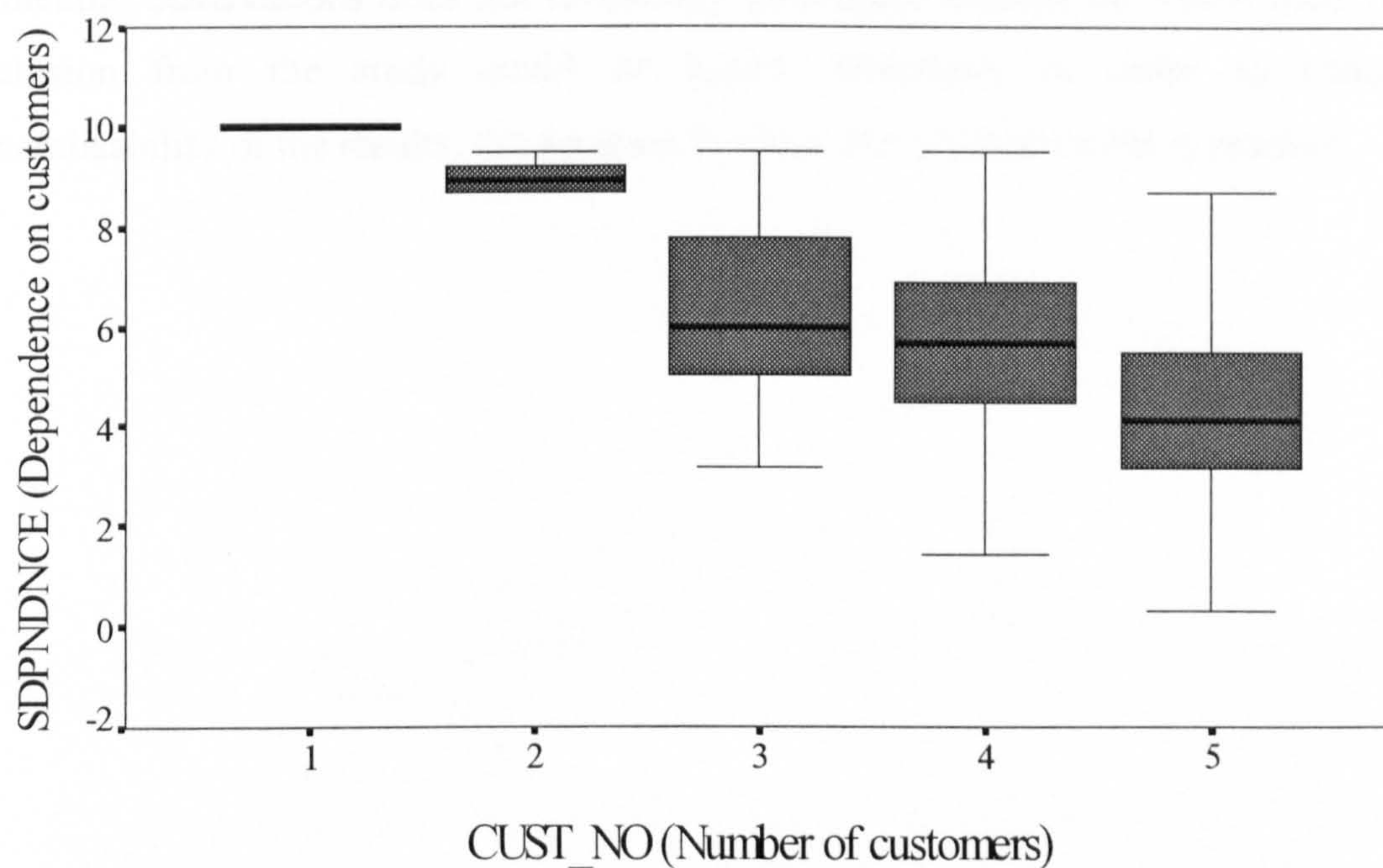


Figure C.44 Boxplot of SDEPNDNCE vs. CUST_NO

Influential observations

The application of the diagnostic measures shown in Table A.1 led to the identification of ten cases as comparatively influential observations. Model estimation for SCHEDULE after omitting these ten cases gave the following results:

Dependent variable	Hypothesised influences (significant)	Estimated coefficients (standardised)	P value	R ²	R ² adj
SDEPNDNCE	CUST_NO	$\beta_{71} = -0.43$	0.0000	0.192	0.188

Table C.8 Results of multiple regression analysis for SDEPNDNCE after omitting influential observations

As illustrated in Table A.8, the model estimated after the influential cases are eliminated does not differ from the original model in terms of significant influences and levels of significance. The change in the value of R² adj, from 0.199 in the original sample to 0.188, is extremely small. A case-by-case examination of the influential observations does not reveal any theoretical reasons on which their final exclusion from the study could be based. Therefore, in order to enhance generalisability of the results, the decision to retain the original model is reached.

DEPENDENT VARIABLE: SINVENTRY

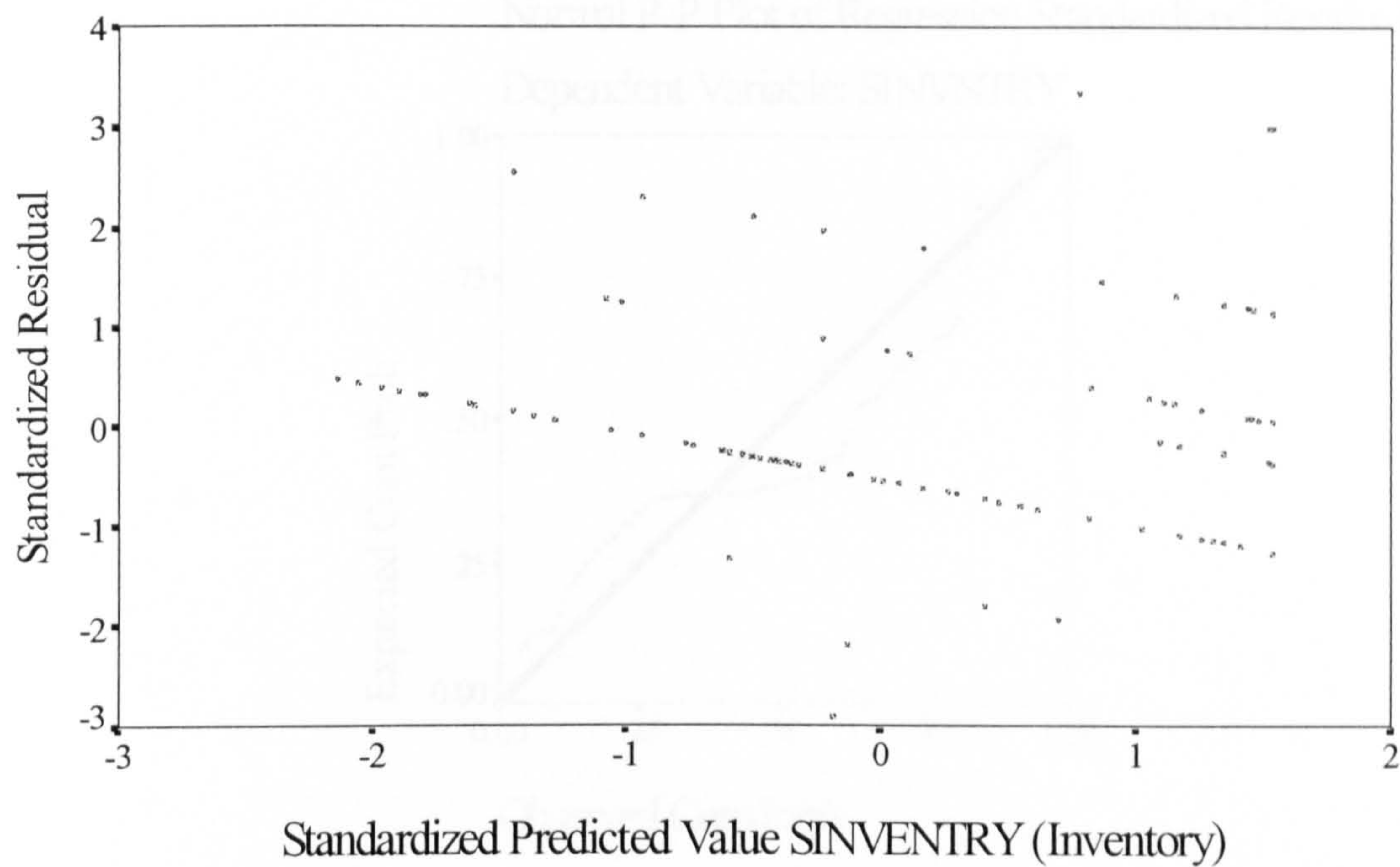


Figure C.45 Residuals plot for Equation 8 (SINVENTRY)

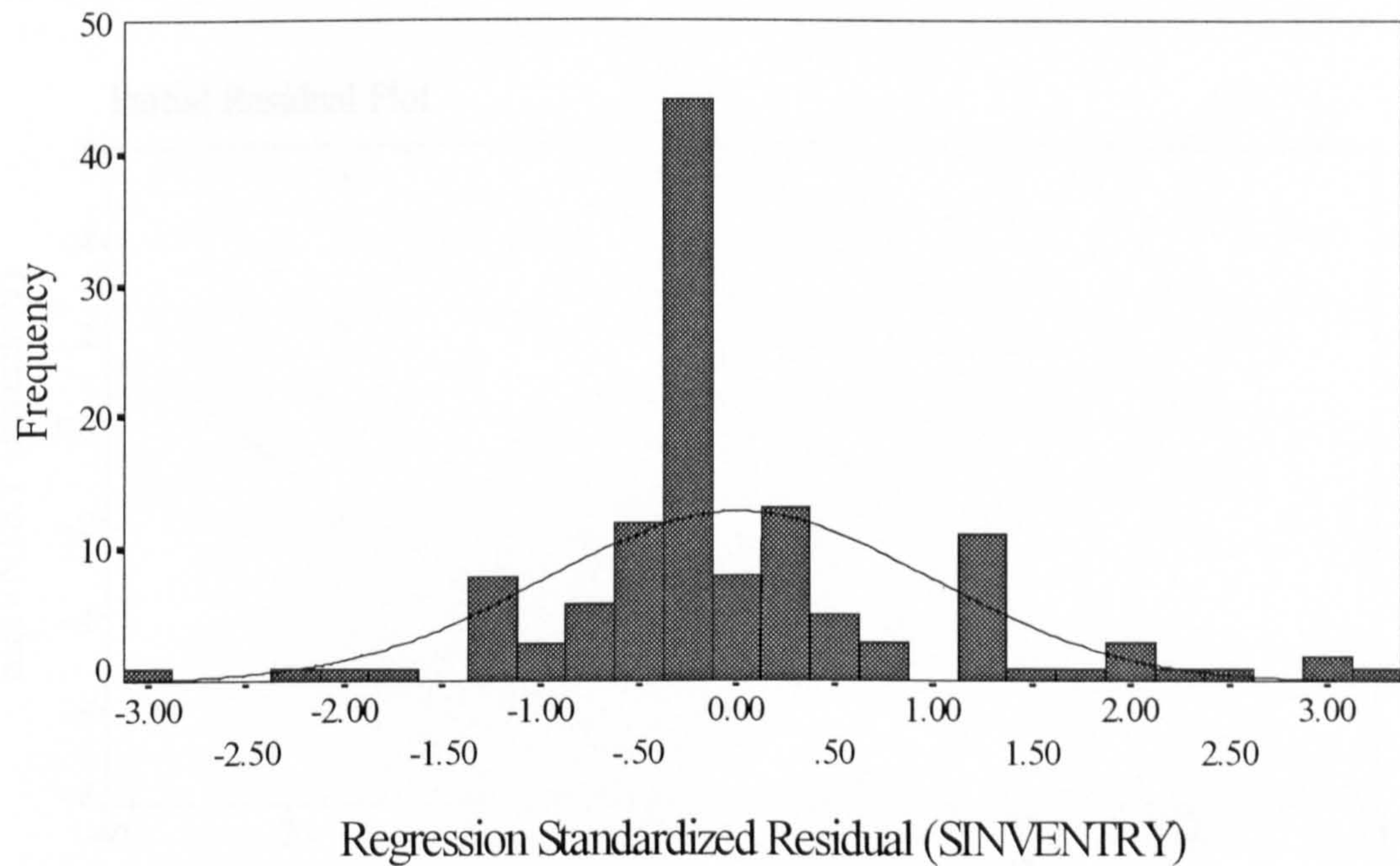


Figure C.46 Histogram of residuals for Equation 8 (SINVENTRY)

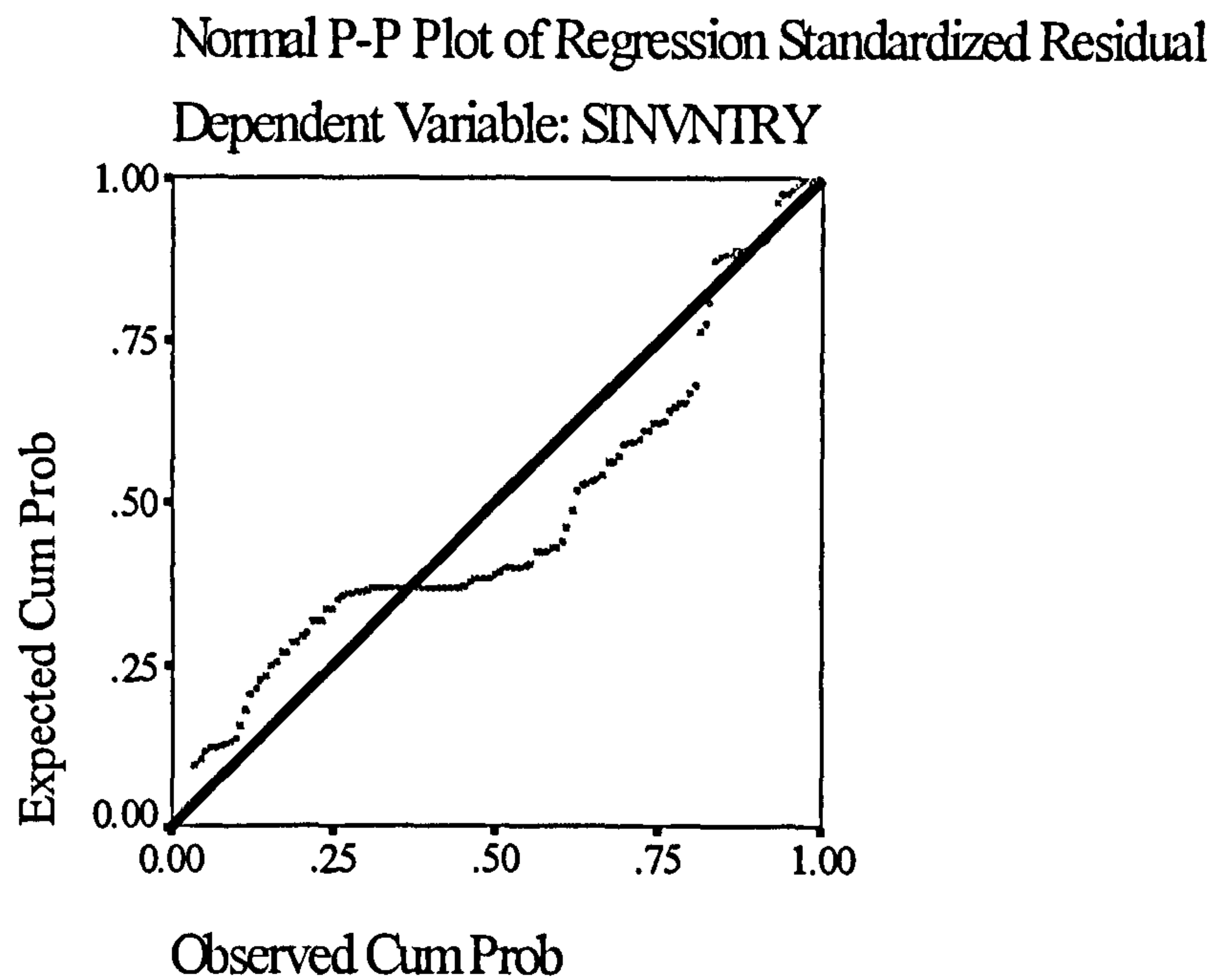


Figure C.47 Normal probability plot for Equation 8 (SINVNTRY)

Figures C.45 to C.47 show moderate departures from the assumptions of multiple regression analysis.

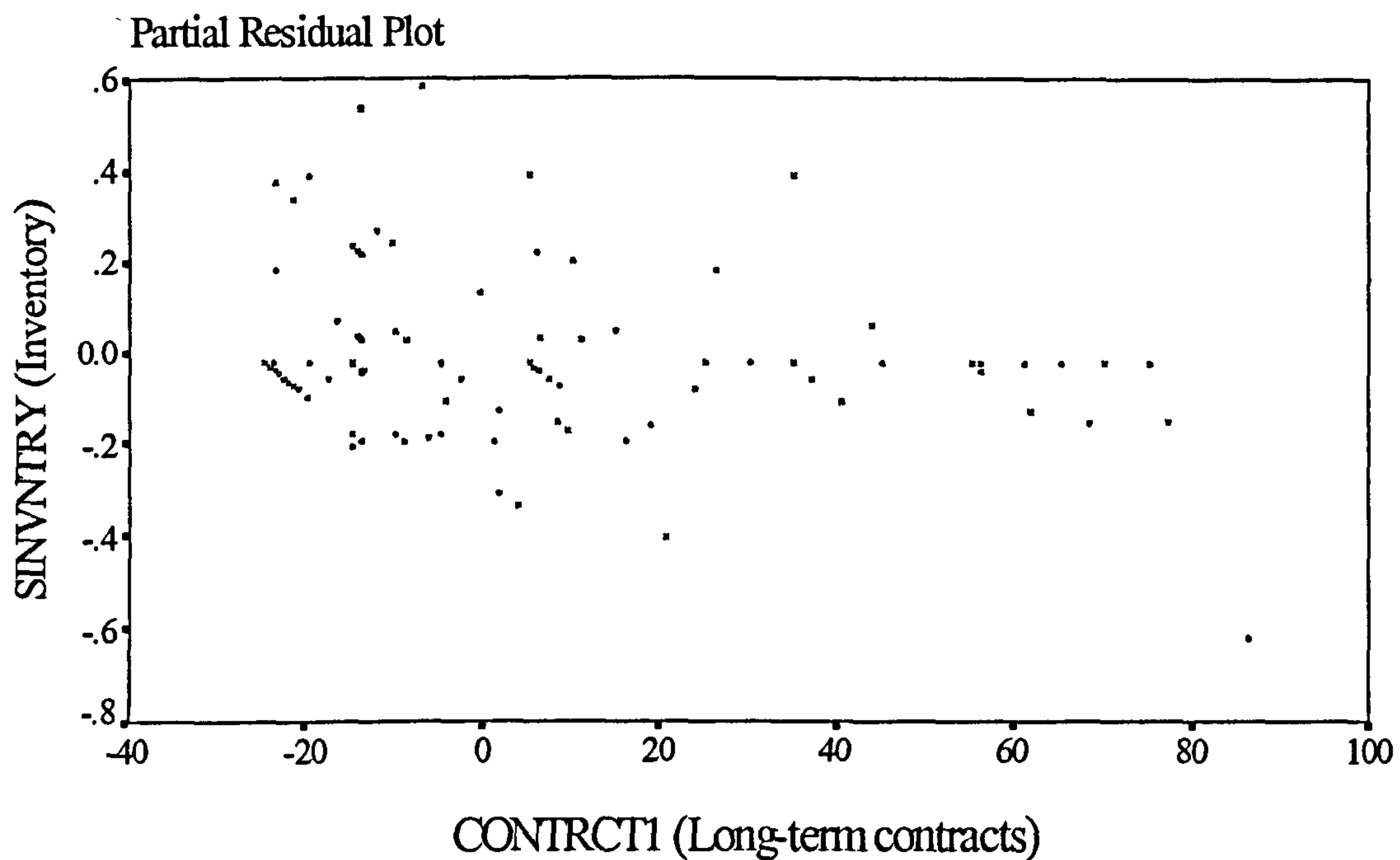


Figure C.48 Partial regression plot of CONTRCT1 and SINVNTRY

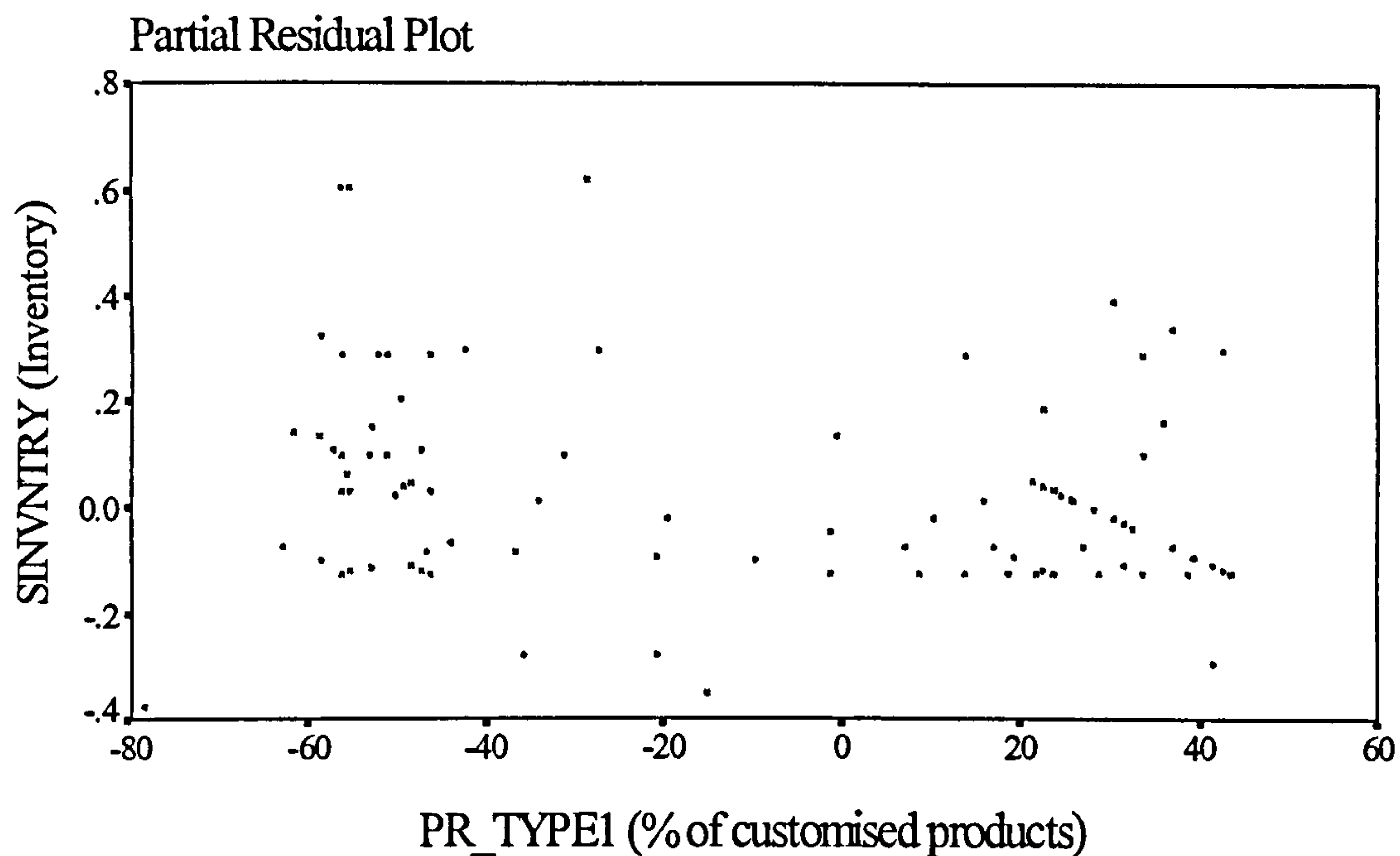


Figure C.49 Partial residual plot of PR_TYPE1 and SINVENTRY

Figures C.48 and C.49 do not indicate any nonlinear patterns in the relationships of the dependent variable with the individual independent variables.

Influential observations

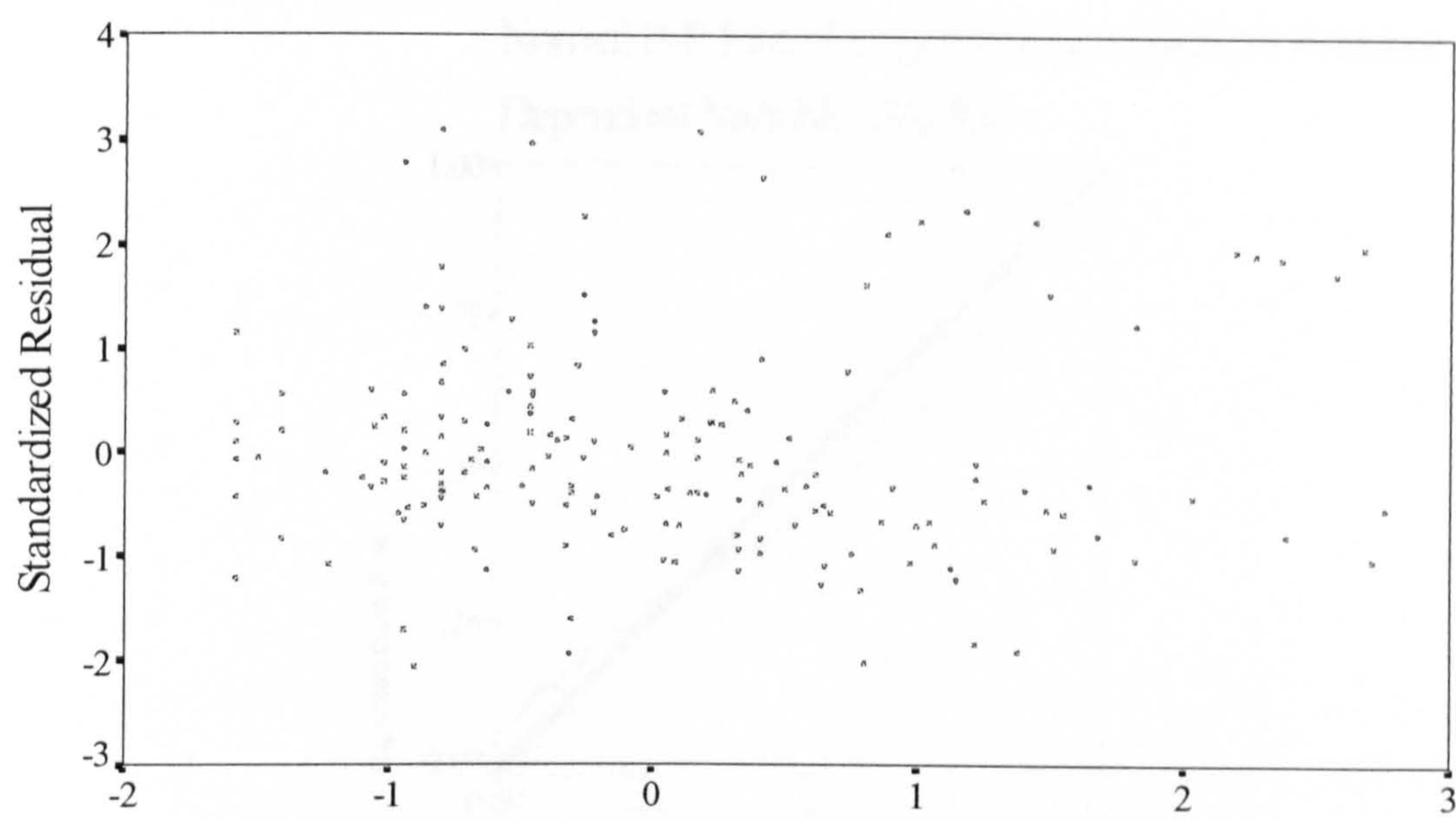
The application of the diagnostic measures shown in Table C.1 led to the identification of six cases as comparatively influential observations. Model estimation for SINVENTRY after omitting these six cases gave the following results:

Dependent variable	Hypothesised influences (significant)	Estimated coefficients (standardised)	P value	R ²	R ² adj
SINVENTRY	CONTRCT1	$\beta_{71} = -0.17$	0.0381	0.221	0.208
	PR_TYPE1	$\beta_{72} = -0.40$	0.0000		

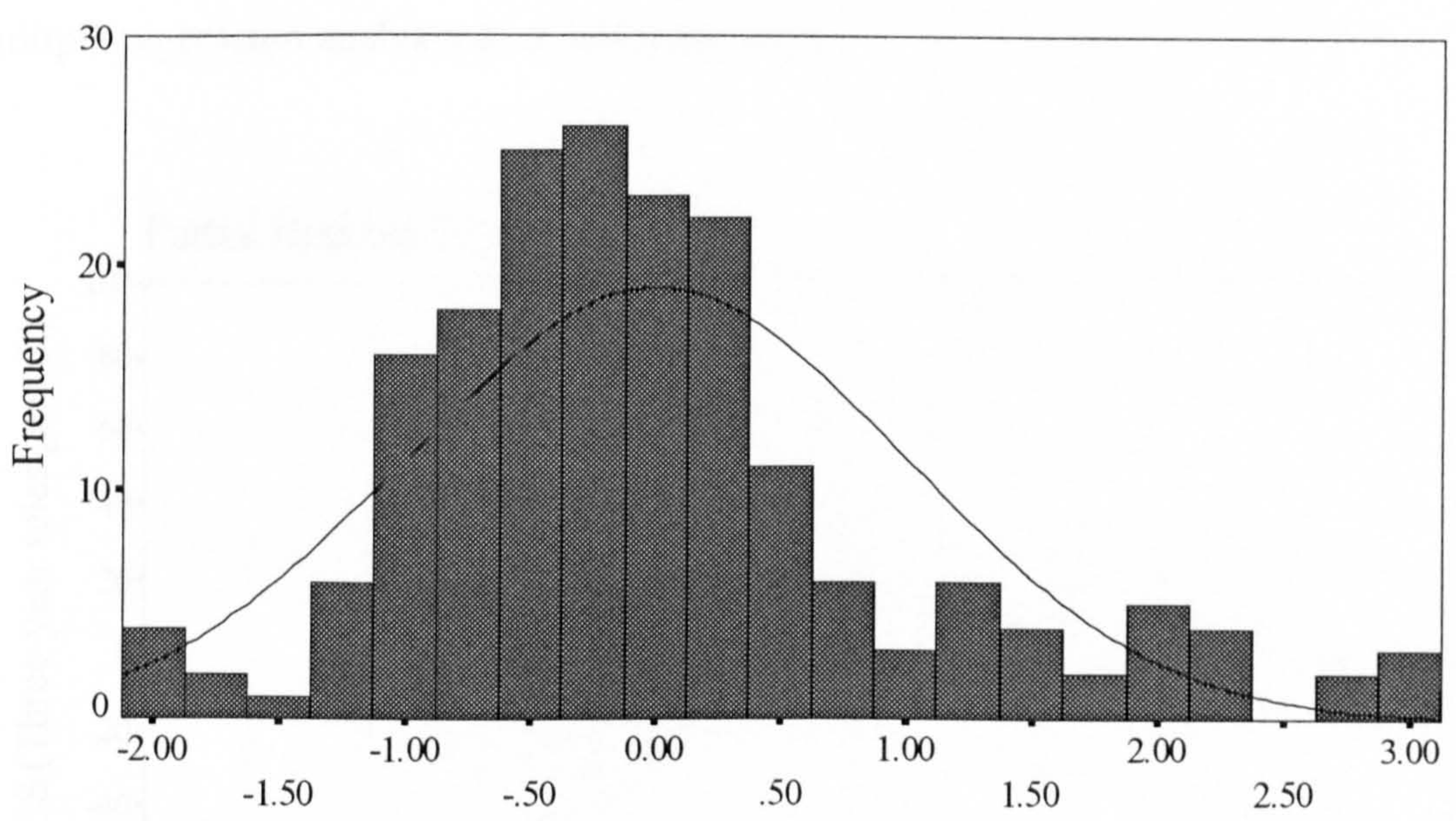
Table C.9 Results of multiple regression analysis for SINVENTRY after omitting influential observations

As illustrated in Table C.9, the model estimated after the influential cases are eliminated does not differ from the original model in terms of significant influences and levels of significance. The improvement in the value of R^2 adj, from 0.171 in the original sample to 0.208, is small. A case-by-case examination of the influential observations does not reveal any theoretical reasons on which their final exclusion from the study could be based. Given that removing some influential observations does not result in a drastic strengthening of relationships the decision to retain the original model is reached in order to enhance generalisability of the results.

DEPENDENT VARIABLE : SALES



Standardized Predicted Value SALES (Three-year sales growth)
Figure C.50 Residuals plot for Equation 9 (SALES)



Regression Standardized Residual SALES (Three-year sales growth)
Figure C.51 Histogram of residuals for Equation 9 (SALES)

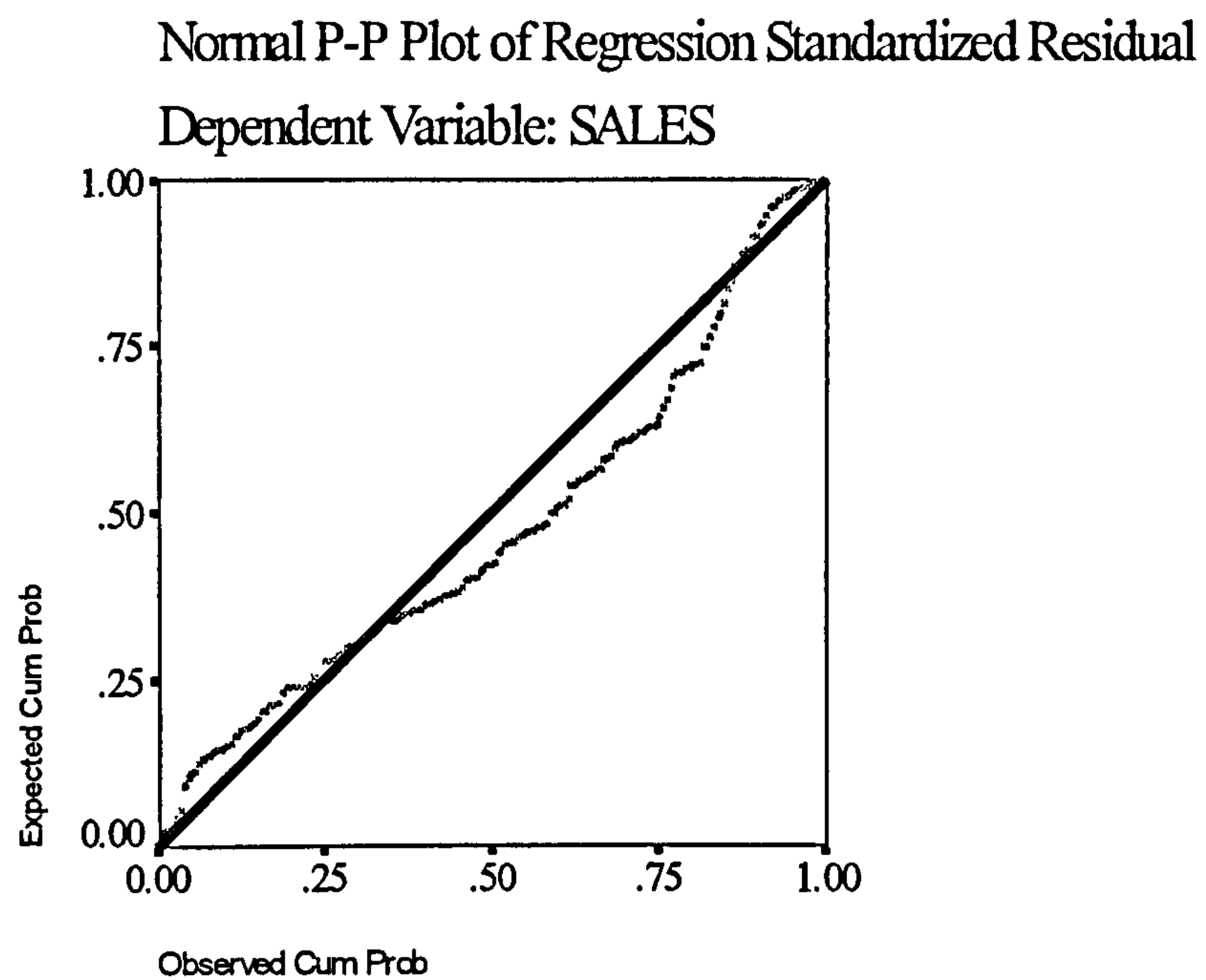


Figure C.52 Normal probability plot for Equation 9 (SALES)

Figures C.50 to C.52 indicate that the regression variate meets the assumptions of multiple regression analysis at an adequate level.

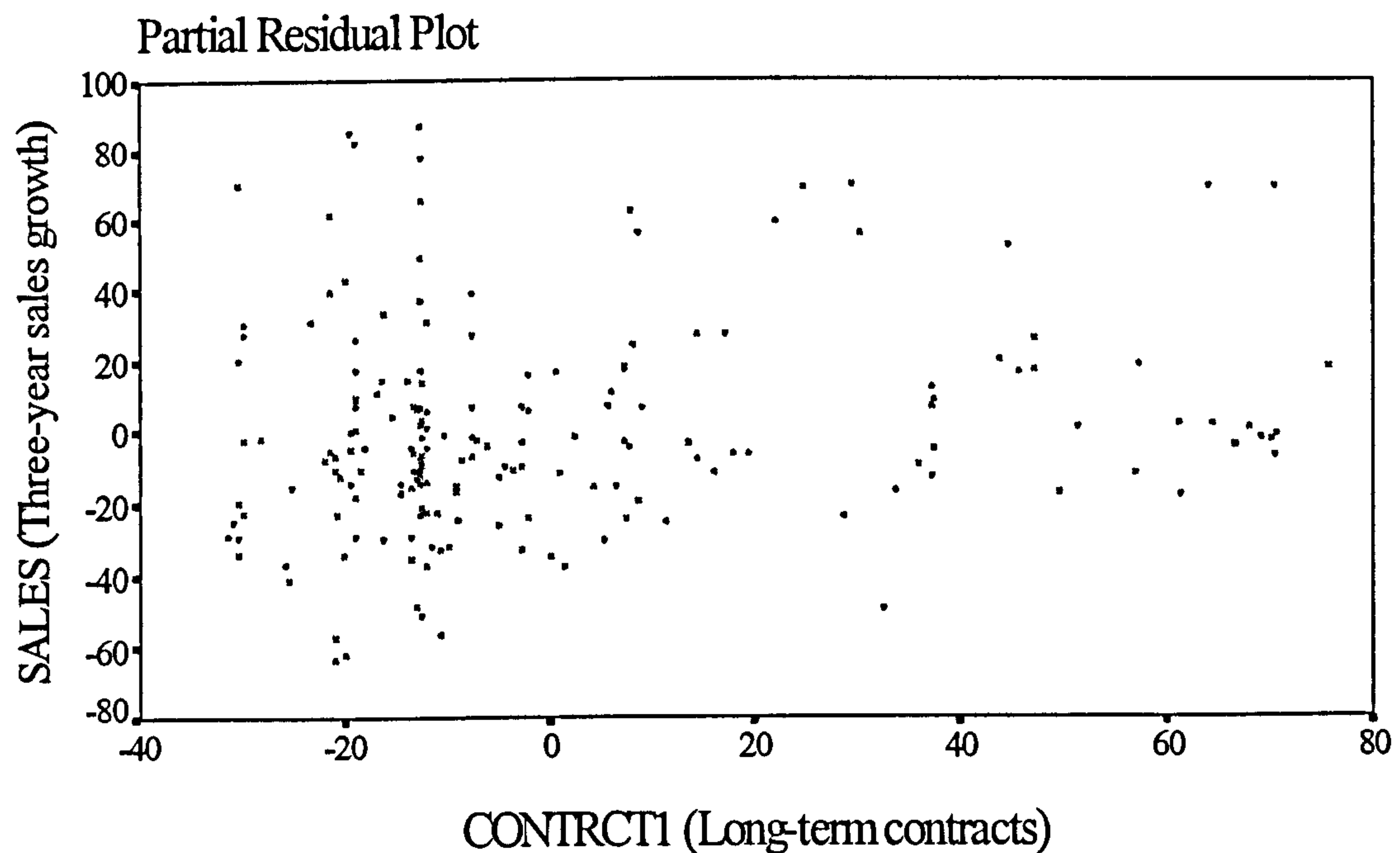


Figure C.53 Partial residual plot for CONTRCT1 and SALES

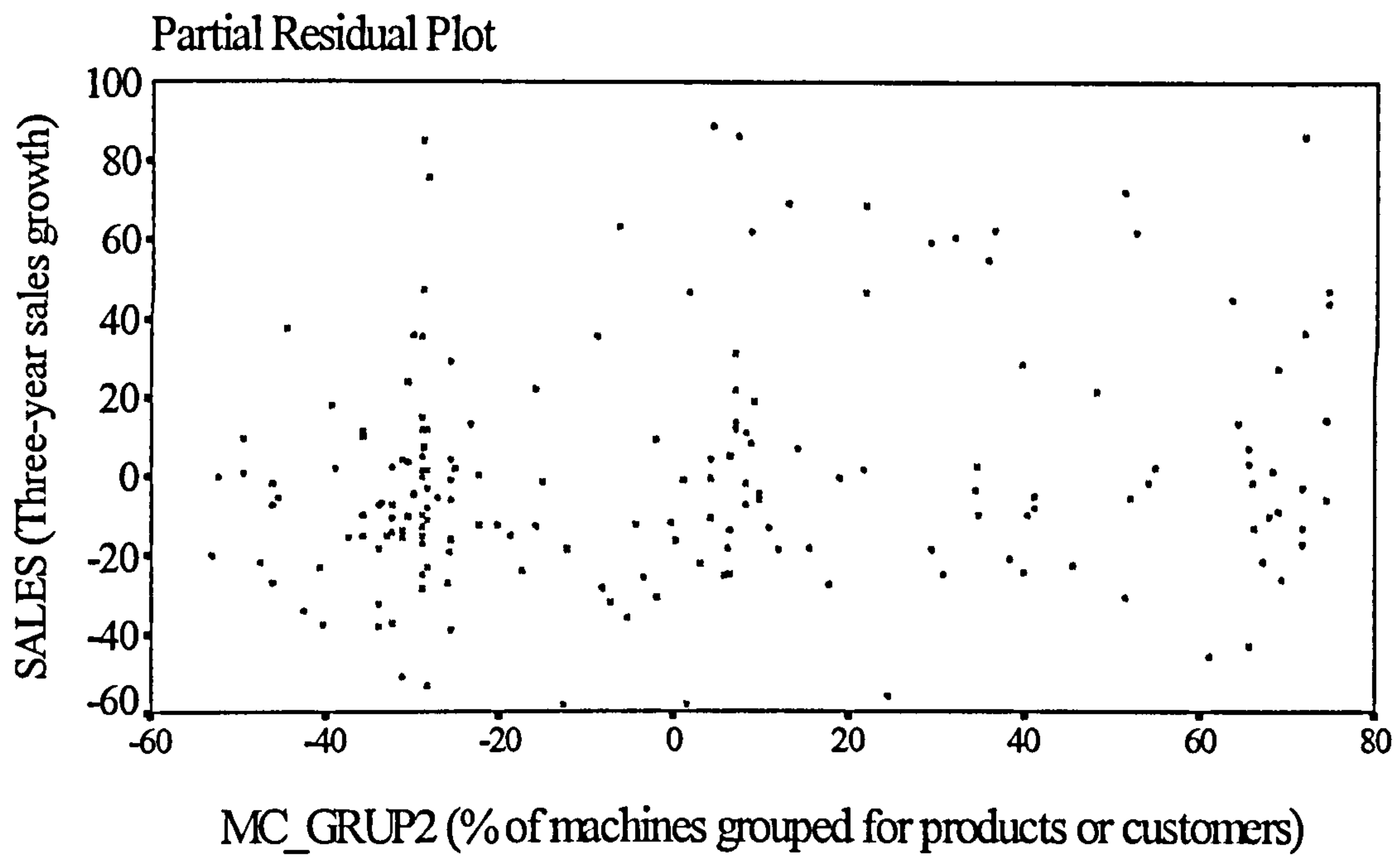


Figure C.54 Partial residual plot for MC_GRP2 and SALES

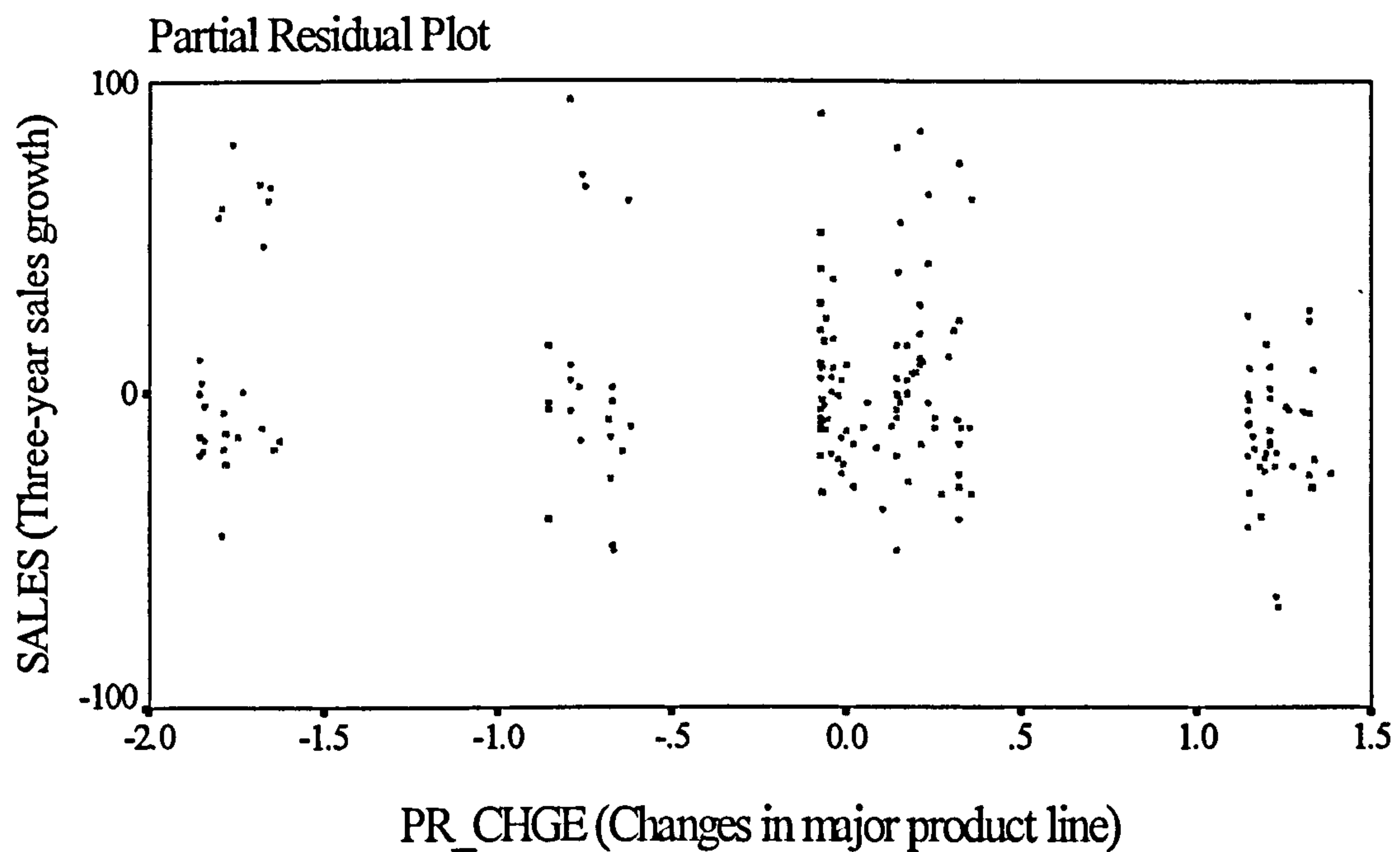


Figure C.55 Partial residual plot for PR_CHGE and SALES

Figures C.53 to C.55 do not indicate any nonlinear patterns in the relationships of the dependent variable with the individual independent variables.

Influential observations

The application of the diagnostic measures shown in Table C.1 led to the identification of seven cases as comparatively influential observations. Model estimation for SCHEDULE after omitting these seven cases gave the following results:

Dependent variable	Hypothesised influences (significant)	Estimated coefficients (standardised)	P value	R ²	R ² adj
SALES	CONTRCT1	$\beta_{91} = 0.22$	0.0027	0.132	0.118
	MC_GRP2	$\beta_{94} = 0.17$	0.0196		
	PR_CHGE	$\beta_{96} = -0.16$	0.0171		

Table C.10. Results of multiple regression analysis for SALES after omitting influential observations

As illustrated in Table C.10, the model estimated after the influential cases are eliminated does not differ from the original model in terms of significant influences and levels of significance. The improvement in the value of R² adj, from 0.112 in the original sample to 0.118, is negligible. A case-by-case examination of the influential observations does not reveal any theoretical reasons on which their final exclusion from the study could be based. Given that removing some influential observations does not result in a strengthening of relationships the decision to retain the original model is reached in order to enhance generalisability of the results.

DEPENDENT VARIABLE : GROWTH

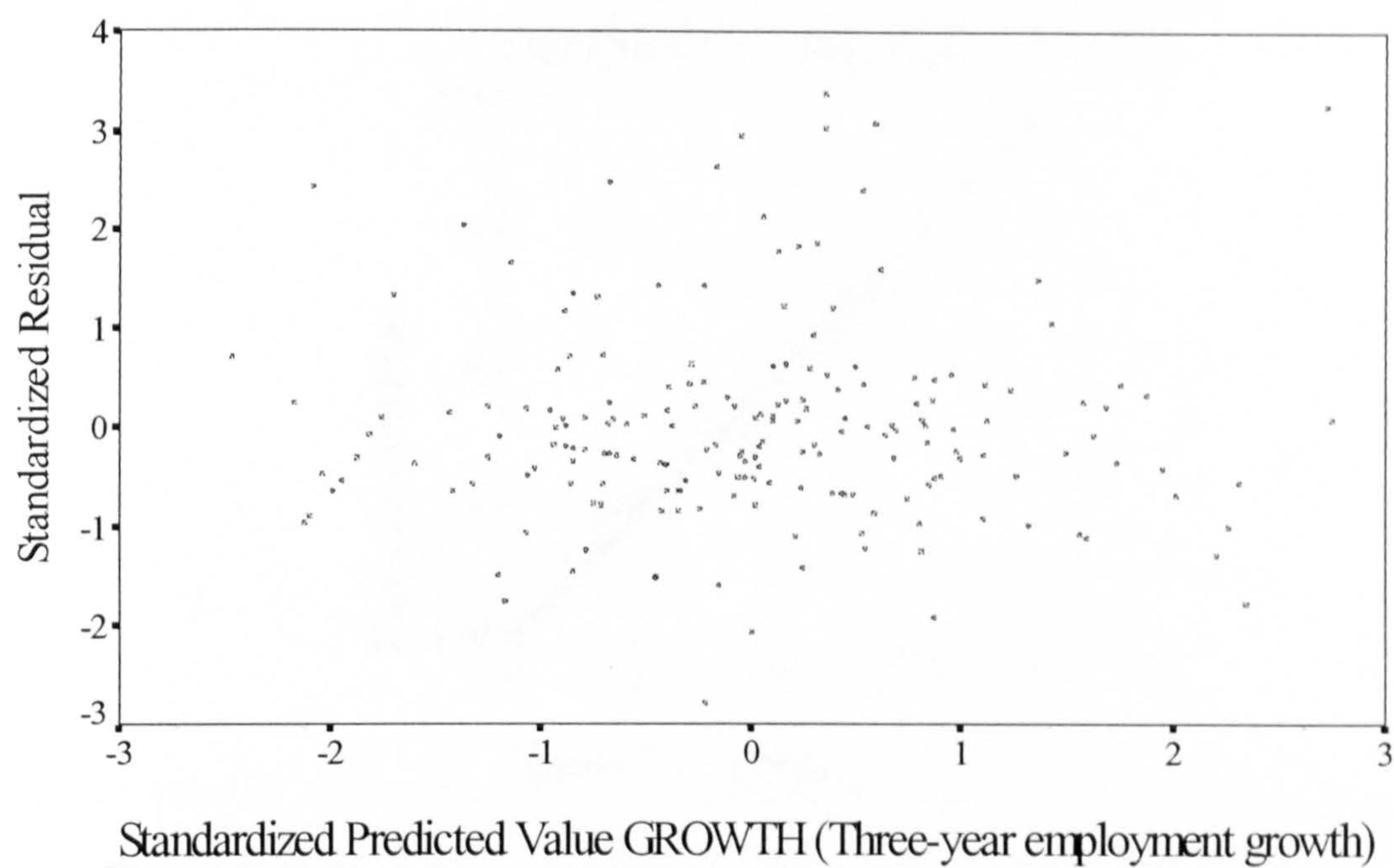


Figure C.56 Residuals plot for Equation 10 (GROWTH)

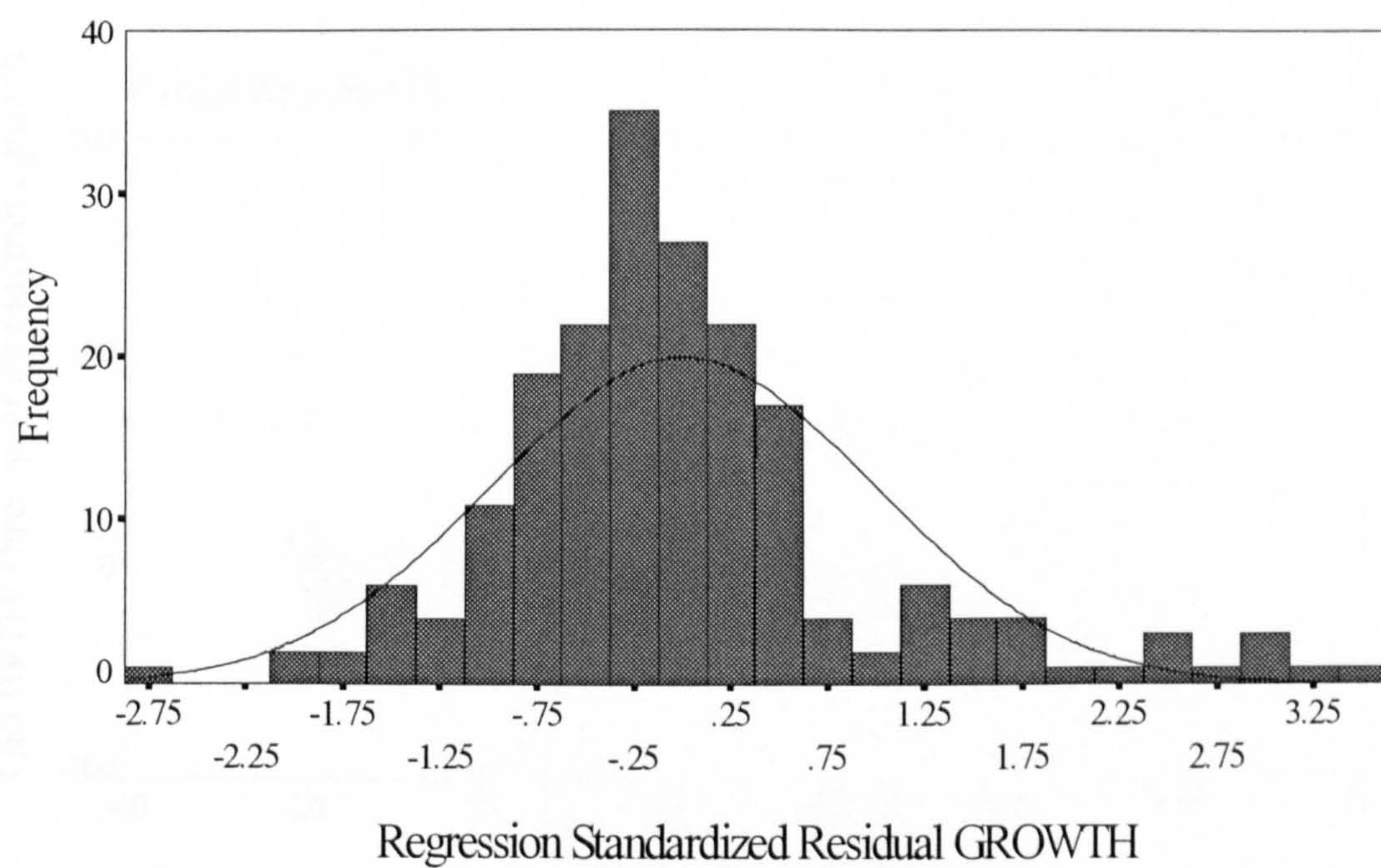


Figure C.57 Histogram of residuals for Equation 10 (GROWTH)

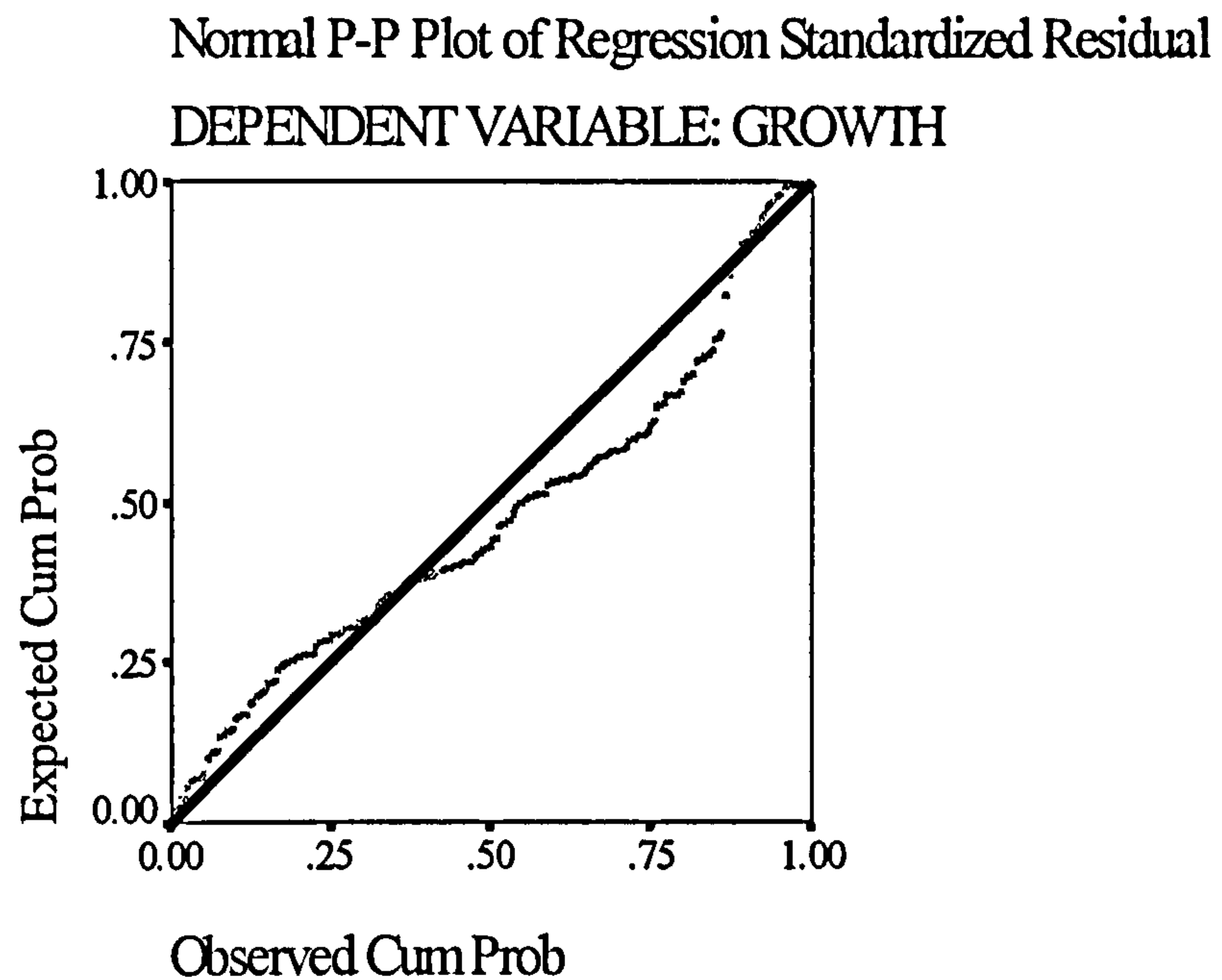


Figure C.58 Normal probability plot for Equation 10 (GROWTH)

Figures C.56 to C.58 indicate that the regression variate meets the assumptions of multiple regression analysis at an adequate level.

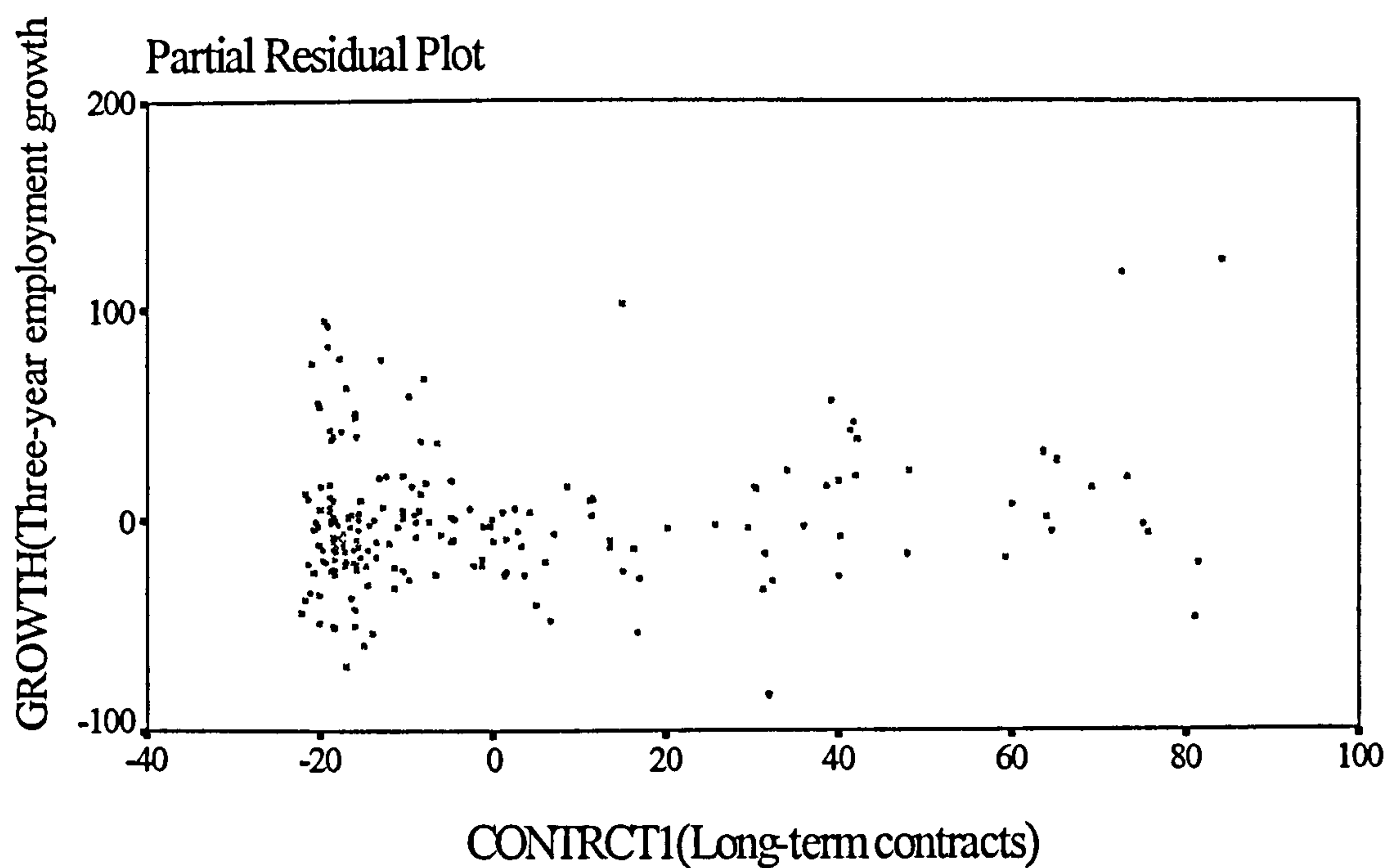


Figure C.59 Partial residual plot of CONTRCT1 and GROWTH

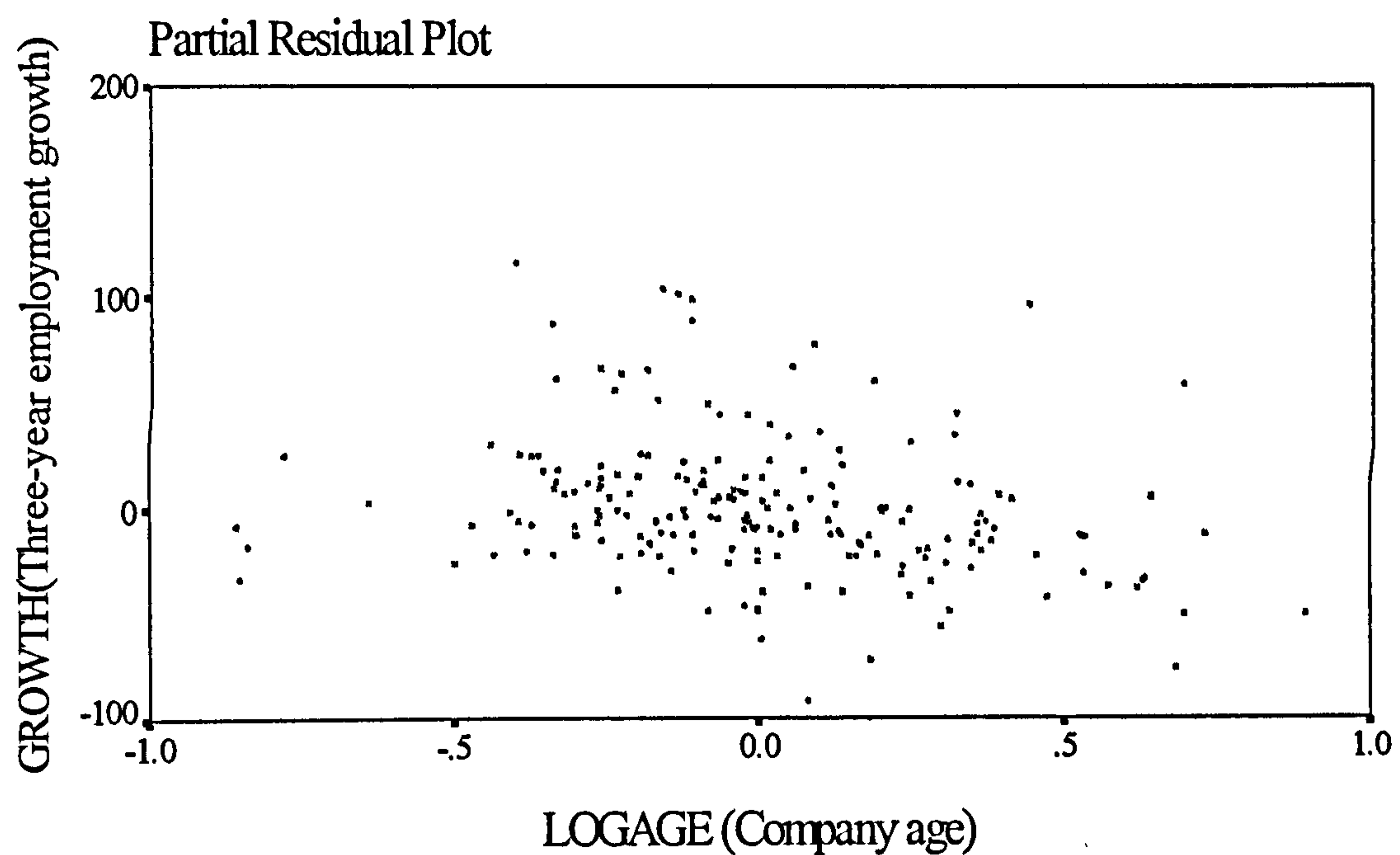


Figure C.60 Partial residual plot of LOGAGE and GROWTH

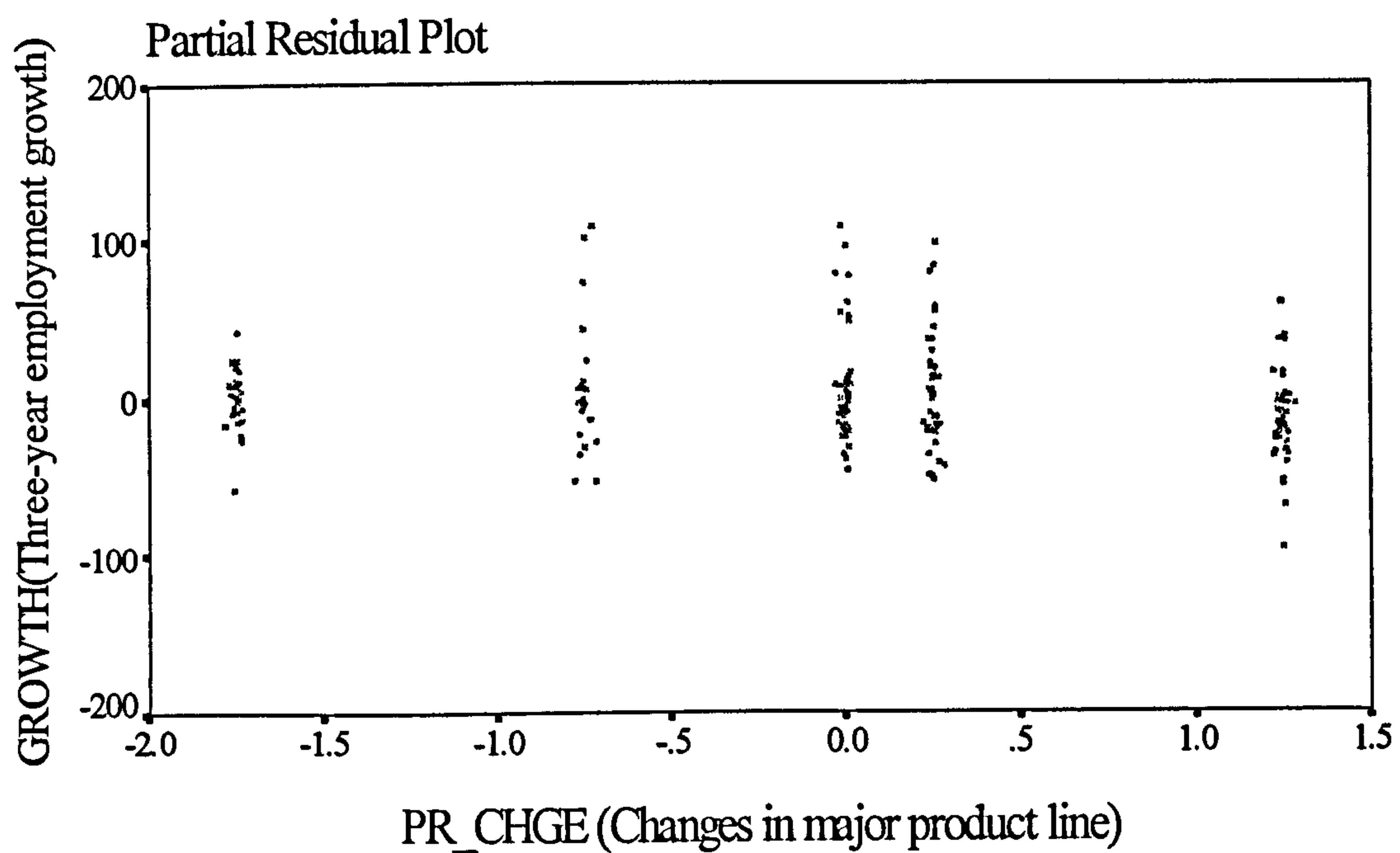


Figure C.61 Partial residual plot of PR_CHGE and GROWTH

Figures C.59 to C.61 do not indicate any nonlinear patterns in the relationships of the dependent variable with the individual independent variables.

Influential observations

The application of the diagnostic measures shown in Table C.1 led to the identification of four cases as comparatively influential observations. Model estimation for GROWTH after omitting these four cases gave the following results:

Dependent variable	Hypothesised influences (significant)	Estimated coefficients (standardised)	P value	R ²	R ² adj
GROWTH	CONTRCT1	$\beta_{10,1} = 0.13$	0.0679	0.109	0.105
	PR_CHGE	$\beta_{10,6} = -0.12$	0.0759		
	LOGAGE	$\beta_{10,8} = -0.33$	0.0000		

Table C.11 Results of multiple regression analysis for GROWTH after omitting influential observations

As illustrated in Table C.11, the model estimated after the influential cases are eliminated differs from the original model in terms of the levels of significance of the significant influences. The relationships of GROWTH with CONTRCT1 and PR_CHGE weaken. The change in the value of R² adj, from 0.097 in the original sample to 0.105, is negligible. A case-by-case examination of the influential observations does not reveal any theoretical reasons on which their final exclusion from the study could be based. A number of observations with high growth levels have been identified as influential observations. Given that removing some influential observations does not result in a strengthening of relationships the decision to retain the original model is reached in order to enhance generalisability of the results.

Testing for multicollinearity

The assessment of the impact of multicollinearity on the study results is summarised in Table C.12. The high tolerance values (and correspondingly low VIF values) suggest that mulitcollinearity is not a problem for this study.

Dependent variable	Hypothesised influences (significant)	Tolerance	VIF
CONTRCT1	FACTOR3	0.927613	1.078
	SUB	0.928449	1.077
	CU_ORDER	0.971602	1.029
	LOGEMPNO	0.969629	1.031
TIME	FACTOR3	1.000000	1.000
DE_PLCY3	FACTOR3	1.000000	1.000
SCHEDULE	SUB	0.967922	1.033
	CU_ORDER	0.978878	1.022
	PR_TYPE1	0.954049	1.048
	COMP_NO	0.972470	1.028
CUST_NO	FACTOR3	0.994220	1.006
	MKTG2	0.907992	1.101
	MKTG3	0.913025	1.095
SDEPNDNCE	FACTOR3	0.937916	1.066
	SUB	0.938846	1.065
	MKTG2	0.904205	1.106
	MKTG3	0.908812	1.100
SINVENTORY	CONTRCT1	0.975416	1.025
	PR_TYPE1	0.975416	1.025
SALES	CONTRCT1	0.937987	1.066
	PR_CHGE	0.993832	1.006
	MC_GRP2	0.933670	1.071
GROWTH	CONTRCT1	0.992393	1.008
	PR_CHGE	0.999845	1.000
	LOGAGE	0.992244	1.008

Table C.12 Assessing the impact of multicollinearity on the study results

APPENDIX D
VALIDATION OF THE RESULTS OF MULTIPLE REGRESSION
ANALYSIS

Appendix D. Validation of the results of multiple regression analysis

In order to validate the results of the multiple regression analysis, the original sample was split into two subsamples and multiple regression was performed for each one. The following Tables illustrate the results of the validation process.

Model Component	Overall	Sample 1	Sample 2
<i>Independent variables</i>			
FACTOR1			
Beta coefficient	0.17	0.21	0.17
P value	0.0072	0.0252	0.0803
LOGSUB			
Beta coefficient	0.13	Not entered	0.24
P value	0.0387		0.0077
CU_ORDER			
Beta coefficient	0.24	0.25	0.26
P value	0.0002	0.0072	0.0044
LOGEMPNO			
Beta coefficient	0.27	0.35	0.22
P value	0.0000	0.0002	0.0175
<i>Model Fit</i>			
R ²	0.227	0.245	0.223
Adjusted R ²	0.211	0.221	0.199

Table D.1: Split-Sample Validation of the Stepwise Estimation for CONTRCT1

Model Component	Overall	Sample 1	Sample 2
<i>Independent variables</i>			
FACTOR1			
Beta coefficient	0.31	0.24	0.36
P value	0.0000	0.0172	0.0002
<i>Model Fit</i>			
R ²	0.100	0.057	0.136
Adjusted R ²	0.096	0.047	0.127

Table D.2: Split-Sample Validation of the Stepwise Estimation for TIME

Model Component	Overall	Sample 1	Sample 2
<i>Independent variables</i>			
FACTOR1			
Beta coefficient	0.20	0.19	0.24
P value	0.0042	0.0430	0.0178
<i>Model Fit</i>			
R ²	0.040	0.039	0.058
Adjusted R ²	0.036	0.030	0.048

Table D.3 Split-Sample Validation of the stepwise estimation of DE_PLCY3

Model Component	Overall	Sample 1	Sample 2
<i>Independent variables</i>			
LOGSUB			
Beta coefficient	0.20	0.23	0.21
p value	0.0028	0.0121	0.0285
CU_ORDER			
Beta coefficient	0.13	Not entered	0.37
p value	0.0485		0.0002
PR_TYPE1			
Beta coefficient	0.18	0.27	Not entered
p value	0.0087	0.0038	
COMP_NO			
Beta coefficient	0.14	0.19	Not entered
p value	0.0418	0.0355	
FACTOR 1			
Beta Coefficient	Not entered	Not entered	0.23
P value			0.0138
<i>Model Fit</i>			
R ²	0.148	0.194	0.220
Adjusted R ²	0.130	0.170	0.193

Table D.4 Split-Sample Validation of the stepwise estimation of SCHEDULE

Model Component	Overall	Sample 1	Sample 2
<i>Independent variables</i>			
FACTOR1			
Beta coefficient	-0.25	-0.27	-0.24
p value	0.0001	0.0050	0.0095
MKTG2			
Beta coefficient	0.21	0.21	0.27
p value	0.0027	0.0323	0.005
MKTG3			
Beta coefficient	0.19	0.20	0.16
p value	0.0063	0.0393	0.0884
<i>Model Fit</i>			
R ²	0.157	0.151	0.142
Adjusted R ²	0.144	0.125	0.125

Table D.5 : Split-Sample Validation of the stepwise estimation of CUST_NO

Model Component	Overall	Sample 1	Sample 2
<i>Independent variables</i>			
CUST_NO			
Beta coefficient	-0.45	-0.51	-0.38
p value	0.0000	0.0000	0.0001
<i>Model Fit</i>			
R ²	0.203	0.269	0.150
Adjusted R ²	0.199	0.261	0.142

Table D.6: Split-Sample Validation of the stepwise estimation of SDEPNDNCE

Model Component	Overall	Sample 1	Sample 2
<i>Independent variables</i>			
CONTRCT1			
Beta coefficient	-0.21	-0.33	Not entered
p value	0.0111	0.0050	
PR_TYPE1			
Beta coefficient	-0.34	-0.32	-0.38
P value	0.0001	0.0059	0.0019
<i>Model Fit</i>			
R ²	0.184	0.243	0.147
Adjusted R ²	0.171	0.218	0.133

Table D.7: Split-Sample validation of the stepwise estimation of SINVNTRY

Model Component	Overall	Sample 1	Sample 2
<i>Independent variables</i>			
CONTRCT1			
Beta coefficient	0.17	0.11	0.24
p value	0.0188	Not entered	0.0195
MC_GRP2			
Beta coefficient	0.18	0.18	0.21
P value	0.0102	0.0776	0.0401
PR_CHGE			
Beta coefficient	-0.21	-0.28	-0.18
P value	0.0024	0.0055	0.0792
<i>Model Fit</i>			
R ²	0.130	0.080	0.125
Adjusted R ²	0.116	0.070	0.106

Table D.8: Split-Sample validation of the stepwise estimation of SALES

Model Component	Overall	Sample 1	Sample 2
<i>Independent variables</i>			
CONTRCT1			
Beta coefficient	0.14	Not entered	0.36
p value	0.0434		0.0001
PR_CHGE			
Beta coefficient	-0.14	-0.19	Not entered
P value	0.0397	0.0405	
LOGAGE			
Beta coefficient	-0.25	-0.37	-0.18
P value	0.0002	0.0001	0.0736
MC_GRP2			
Beta coefficient	Not entered	Not entered	0.20
P value			0.0279
<i>Model Fit</i>			
R ²	0.130	0.178	0.216
Adjusted R ²	0.116	0.160	0.200

Table D.9 : Split sample validation of stepwise estimation for GROWTH